MODERN MECHANIX

AND INVENTIONS

1934 JUNE

NOW 15¢

IN CANADA 20¢

Reference Dept.
7th TIER

SEE PAGE 63

INSIDE UNCLE SAM'S NEW GOLD VAULT

BURIED ALIVE WITH THE TUNNEL BUILDERS

HUNDREDS Have ALREADY Won Big Cash Rewards

I WON $5,000.00 — ANNA JACOBSON-N.J.

I WON $4,740.00 — D. BEEMER-MICH.

I WON $4,705.00 — MRS. KATE NEEDHAM

I WON $3,700.00 — E. NYSTROM-ORE.

I WON $2,565.00 — HELEN SHICK - PA.

I WON $1,200.00 — J. O. CASHNER - MO.

I WON $1,000.00 — L. SWONDANK-MINN.

Now—100 MORE Cash Prizes Being Given Away

Would YOU, TOO, Like to Win $2,500.00

or Buick Sedan & $1,000.00?

DO YOU want money? — a small fortune? — $2,500.00 in *real* Cash? Here's your opportunity! And not one cent of your money is required now or ever to win it. This is our sensational new way to advertise. We want people everywhere talking about our company *quick*. So we are *giving away thousands* of Dollars — real fortunes — 100 cash prizes totaling over $5,000.00 — besides thousands of dollars in Extra cash rewards. *Everybody* can share in these cash rewards. Wouldn't you, too, like to win a brand new Buick Sedan and $1,000.00 (or $2,500.00 all cash)?

Can YOU Find 4 Dogs in Picture at Right?

Some are upside down. Some sidewise. Can you find 4 dogs? Mark the dogs you find, clip picture and mail quick. *Hundreds* of people have won thousands of dollars in cash rewards in other advertising campaigns conducted by men in this big company. Above are a few. Now comes *your* chance. Maybe this great opportunity sounds like a dream to you, but I'll be happy to send you the $2,500 or Buick and $1,000.00 the minute you win it.

Not a Penny of Your Money Needed

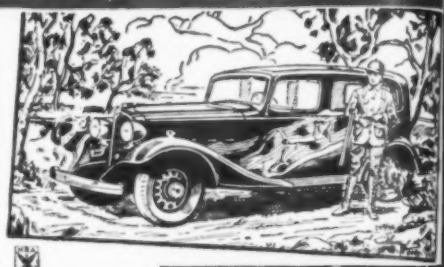
All these prizes are being given *outright* to winners. Not a penny of your money needed to buy *anything*. *Not* a lottery. No luck or skill needed. Nothing to write. Imagine the joy of receiving a letter from me with $2,500.00 in it! Oh, boy, what a thrill! Hurry — get started quick by finding 4 dogs. *Nothing* for you to lose.

You Are SURE to Win

a Cash Reward if You Do as I Ask

You are absolutely GUARANTEED to win a cash reward if you take an active part. But hurry! First active, first rewarded! Think of all the happiness $2,500.00 can bring you! We are reliable! I invite you to look us up through any credit agency, any bank in Des Moines, any business house, railroad, express company, magazine, newspaper. . . . We are well known national advertisers.

$10,000.00 REWARD We will pay $10,000.00 forfeit to any worthy charity if anyone can prove that we do not really give away all these thousands of dollars in prizes — or that all this prize money is not in the bank waiting to promptly pay every prize winner — or that we will not fulfill every guarantee we make. We are a big, responsible firm.



ALL PRIZE MONEY NOW IN BANK

All the thousands of dollars to pay every prize winner is now in the big, strong Bankers Trust Co. bank in Des Moines.

$1,000.00 EXTRA FOR PROMPTNESS

I will pay First Grand Prize winner $1,000.00 extra just for promptness — a Buick and $1,000.00 (or $2,500.00 if all cash is preferred). Do you want it? Then hurry. Not only *one* person, but *hundreds will win* cash rewards. In case of ties duplicate prizes will be given.

MAIL COUPON QUICK

Just mark the dogs you find, clip picture and mail quick with coupon below — or write on a penny post-card how many dogs you find. Don't send a cent. By replying I will tell you how you may share in thousands of dollars in EXTRA cash rewards and win $2,500.00, too. Answer today.

Tell me which you desire to win—$2,500 all cash or Buick and $1,000.00? Merrold Johnson, Prize Mgr., Dept. 234, Des Moines Iowa

Merrold Johnson, Prize Manager,
Dept. 234, Des Moines, Iowa.
I have found 4 hunting dogs in your picture and am anxious to win.

Name.....

Address.....

City..... State.....
(Mark in square which you would prefer to win)
☐ Buick and $1,000.00, or ☐ $2,500.00 All Cash.

PRICE 15 CENTS
(20 CENTS IN CANADA)

MODERN MECHANIX AND INVENTIONS

JUNE
1934

Volume XII
Number 2

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L. B. Robbins
Nationally Known Radio Expert

S. S. Rabl
Seaplane Designer and Naval Architect

Ray F. Kuns
Principal, Cincinnati Automotive Trade School

LEARN RADIO FROM REAL RADIO ENGINEERS

HERE THEY ARE:
Dr. C. M. Blackburn, Chief Radio Engineer, Grigsby-Grunow Company (Majestic).
Kendall Clough, Chief Engineer, Clough-Brengle Co. (Radio Engineers and Manufacturers)
Karl Hassel, Chief Engineer, Zenith Radio Corporation.
Homer Hogan, Gen. Manager, Radio Station KYW, Chicago.
R. MacGregor, Service Manager and Sales Engineer, Transformer Corporation of America (Clarion).
B. C. Tittle, Chief Radio Engr., Stewart-Warner Corporation.
F. D. Whitten, Service Manager, Chicago Plant, Philco Radio and Television Corporation.

LET THESE ENGINEERS RIGHT FROM THE HEART OF THE BIG RADIO INDUSTRY *Train You at Home for*

GOOD PAY RADIO WORK

MANY R-T-I TRAINED MEN MAKE $35 TO $75 A WEEK

If you're dissatisfied with small pay—work that's getting you nowhere—lay-offs and uncertain income—here's an opportunity that's too good to miss. At the cost of only the time it takes you to mail the coupon, you can get my big FREE book, "RADIO'S FUTURE AND YOURS." This book tells how you can learn at home to make more money almost at once in Radio—whether you want to make Radio your life's work, or use it to pick up an extra $5 to $20 a week in your spare time.

"RADIO IS GROWING BY LEAPS AND BOUNDS"

says *Radio Craft Magazine*. It has forged ahead even in depression years. Where only a few hundred men were employed a short time ago, thousands are employed today. Where a few years ago a hundred jobs paid $35 to $75 a week—there are thousands of such jobs today. And more new jobs being created all the time—*full time jobs and spare time jobs*. Get my book and see how easy it is to learn at home for this good-pay work.

R-T-I TRAINING IS "SHOP TRAINING" FOR THE HOME

It comes to you right from the Radio Industry—right out of the factories where Radio sets and other vacuum-tube devices are made. It was planned and prepared for you by big radio engineers IN these factories, most of whom are the Chief Engineers of these great Radio plants. And NOW these same engineers are actually supervising R-T-I Training. Which means that trained the R-T-I way, you'll be trained as the Radio Industry wants you trained—just as the Radio Industry, itself, would train you if it was doing the job.

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These are probably the biggest and most expensive Working Outfits ever included with a home-training Course. You use them to build up testing equipment—to experiment with—to do actual Radio work. It's Shop Training for the home.

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Radio service work is just the starting point in R-T-I Training. From there we take you up through the very latest developments in Radio, and then on into the new and larger field of Electronics—Sound Pictures, Public Address Systems, Photo Cells, and Television. This feature alone makes R-T-I the outstanding home training in Radio.

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YOUR MONEY BACK IF YOU ARE NOT SATISFIED

That's my way of doing business. And I'll give you that agreement in writing—an agreement to refund every penny of your tuition if, on completion of my Training, you are not entirely satisfied.

INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results." Send today for my big book "Radio's Future and Yours." The book is free.

RAY D. SMITH, *President*
Radio & Television Institute, Chicago

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and they are talking to YOU

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Without obligation of any kind please send me a copy of "Radio's Future and Yours." I am interested in your home training and the opportunities you say exist in the great field of Radio for the R-T-I Trained man.

Name.....

Address.....

City.....State.....

RANDOM CHIPS from

The Editor must let the cat out of the bag and tell the big news. Here are some interesting letters and some good photos from a few of MM's thousands of enthusiastic fans.

This little fellow is looking over a 32-inch flying model of a biplane built by Les White, who is a model hobbyist.

BIG news for MM's thousands of workshop fans. Just glance at page 41 for the announcement you have been waiting for. If you don't go right out and get your friends together for one of those low charter numbers, we are sadly mistaken.

We had better say no more or we'll be telling the entire story here. Let's turn to our Random Chips.

* * *

Les White of Buffalo, N. Y., is an industrious model builder. We want to hear from more of you model builders. What models do you like best—airplanes, railroads, or boats? Do you want tough projects, such as scale models of full rig ships or motor powered model planes? Mr. White is building the table top railway that appeared in the December issue. Here's what he says:

Buffalo, N. Y.

Dear Editor:

I am building the table top railway described in the December issue. It so happened that the scale of the 00 gauge will fit the miniature village I am working on. This railroading will be something new to me.

As model maker I have made the U. S. S. Texas as a working electric model; a 32-inch biplane that flies; a solid model of Hawk's G. B.; and a scale model of a 38-foot schooner.

All the success in the world to MM and when it is back to two bits I'll continue to read it as before.

Les White.

A photo of the fine little biplane is shown on this page.

* * *

Here's something unusual—a tractor prop wind boat. H. J. Vogt is a real pioneer. He built the wind-pull motor boat shown on this page and tells us this:

Ellenton, Florida.

Modern Mechanix.
Gentlemen:

I am sending a picture of a boat that I made from bottom up. The boat is a Cris Craft type design 20 feet long and 6 feet 6 inches beam. The motor is a Rover 65 h.p. at 1,800 r.p.m. The boat will carry two passengers and pilot at 50 m.p.h. We spent about nine months building the boat in spare time. If anyone is interested I would be glad to answer any questions asked.

I would be glad to see it in your next issue.

Thanking you in advance,

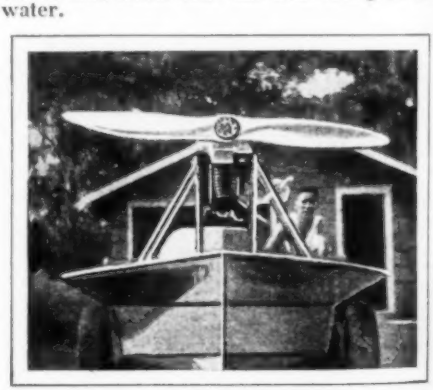
H. J. Vogt,
Ellenton Garage.

That is some speed for the power on that length. Mr. Vogt deserves a world of credit for pioneering in this field.

* * *

Dr. Gunnar P. Linner of Minneapolis, Minn., a Modern Mechanix and Inventions home workshop enthusiast, is building some fine little models powered by small gas engines.

Dr. Linner built a model cabin cruiser powered by a miniature four cylinder Wall internal combustion engine. You can get some idea of the motor's size by looking at the photo. The cruiser is complete in every detail and looks like the real thing in the water.



Here's a pioneer in a new field. A tractor prop wind boat that does 50 miles per hour. H. J. Vogt built this outfit.

the Editor's WORKBENCH

Remember that tough gear contest in the February issue? The winner, superintendent of nurses in a Nebraska hospital, sent us this cheerful little letter:

Hastings, Neb.

Dear Editor:

I wish to acknowledge the receipt of the first prize in your Gear Contest and to express my sincere gratitude for it.

As a graduate nurse, machinery seems rather far removed from my interests, but I am extremely fond of mathematics and regularly purchase and read your magazine in preference to fiction. If it so pleases me with my divergent interests, it must be truly fascinating to those in mechanical pursuits.

Arta Lewis.

Miss Lewis was selected the winner from hundreds of entries. She has a right to be proud, for she won over skilled engineers, mechanics, draftsmen, and students of mathematics.

* * *

One of the best boat photos we have ever seen was sent to the Workbench along with a fine letter from G. W. Martin. He says:

Vancouver, B. C.

Dear Editor:

I thought you might like to know the success my young nephew and I had with the boat we built from your plans which appeared in Modern Mechanix and Inventions of 1930.

Our boat is one of six or seven all built from your plan. Some are factory built and some made by amateurs, and mostly owned by high school boys who spend their summer holidays, day in and day out, sailing and racing in the very pleasant waters in and about our fair city.

The boats are all alike to the eye as seven peas in a pod, but ours can literally sail circles around the others. I can't account for this only that I followed the plans to the fraction of an inch. She is built throughout of red cedar with spruce transom. The cockpit is finished in Honduras mahogany. We call her the Imp.

It gave us great satisfaction to beat decisively that new and much touted "snipe" class boat that is being boosted all along the Pacific coast. We both thank you kindly for the days of pleasure you have given us in your snappy little yacht.

G. W. Martin.

A beauty, you say? So do we. This fine picture shows G. W. Martin's version of MM's popular boat, Sunray.

That's certainly a great boost for MM's Sunray, now included in the plans published in "How to Build Twenty Boats." Please note that Mr. Martin built her according to the plans to the fraction of an inch. Then glance at her snappy lines in the photo.

* * *

Owen R. Tilbury has built a low wing monoplane that he believes to be the smallest airplane in the world to fly successfully. Here's the "low down" on this classy little ship, which has been taking prizes at air meets:

Bloomington, Ill.

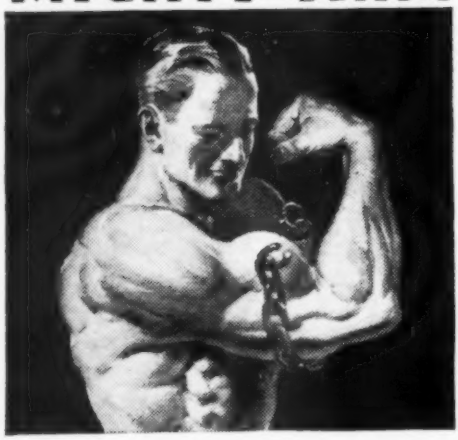
Dear Editor:

Enclosed is a snap shot taken of the "Tilbury Flash." This is a low wing monoplane, cantilever construction, which is believed to be the smallest airplane in the world to ever fly successfully. It was designed and built by the

(Continued on page 28)

Dr. Gunnar P. Linner, of Minneapolis, at work on his smart model cruiser. The miniature, but efficient, Wall engine is shown standing beside the model craft which it powers.

MOULDING A MIGHTY ARM



A Special Course on Arm Building

ONLY 25c

WHY not get an arm of might with the power and grip to obey your physical desires. I have taken weaklings whose arms were scrawny pieces of skin and bone and in a short time developed them into strong men of powerful proportions with bulging biceps and brawny forearms . . . strong, solid arms of power that are respected by men and admired by women.

This course is specially planned to build every muscle in your arm. It has been scientifically worked out for that purpose. Many of my pupils have developed a pair of triceps shaped like a horseshoe, and just as strong, and a pair of biceps that show their double head formation. The sinewy cables between the biceps and elbow are deep and thick with wire cable-like ligaments. The forearm bellies with bulk, the great supinator lifting muscles become a column of power, and their wrists are alive and writhe with corded sinew.

Send 25c for this course today. Why not start now to build a he-man's arm?

You can't make a mistake. The assurance of the strongest armed man in the world stands behind this course. I give you the secrets of strength illustrated and explained as you like them. Mail your order now while you can still get this course for only 25c.

I will not limit you to the arm. Try any one of my courses listed in the coupon at 25c. Or, try all six of them for only $1.00.

RUSH THE COUPON TODAY!

Mail your order now and I will include a FREE COPY of "NERVES OF STEEL, MUSCLES LIKE IRON." It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the Jowett Way! Reach Out . . . Grasp This Special Offer!

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Dept. 37Fc. 422 Poplar St., Scranton, Pa.

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- ☐ Moulding a Mighty Back, 25c
- ☐ Moulding a Mighty Grip, 25c
- ☐ Moulding a Mighty Chest, 25c
- ☐ Moulding Mighty Legs, 25c
- ☐ Strong Man Stunts Made Easy, 25c
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Name ..... Age .....

Address .....

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OUTDOOR LIFE'S regular price is $2.50 per year, or 25c per copy. Above is a SPECIAL HALF PRICE offer. Don't miss it.

OUTDOOR LIFE, 116 Outdoor Life Bldg., Mount Morris, Ill.

Send me OUTDOOR LIFE regularly every month for the next EIGHT MONTHS. Enclosed find $1.00. Also send me ENTIRELY FREE (Mark which one you want)

( ) Cartridge Lighter ( ) Shell Lighter

Name .....

Address .....

You'll have BARRELS OF FUN

when you learn to play this easy as A-B-C way

SUPPOSE you suddenly found you could play easily on your favorite musical instrument! Think of the fun you would have—how much in demand you would be! Do you know that now you can do this in a surprisingly short time?

People used to think that to play a musical instrument *well* meant years of grinding study, hours of dull, tiresome practice.

Thousands now know that this old-fashioned idea is absolutely wrong. All over the country, in cities, towns, and on farms, men and women who never played until a few months ago, are getting delightful thrills of enjoyment from playing their favorite instrument with a new easy talent they never knew they had.

No longer is reading music like a foreign language to those who don't know it! By this simple short-cut method you actually begin to play any popular instrument without knowing one note from another!

Only one school in the world has the right to teach this amazing new method. Invented by the U. S. School of Music it is the exclusive property of this famous institute. Many schools would guard such a valuable discovery and charge enormous fees for teaching it.

But the U. S. School of Music makes this system available to *everybody* at a cost so low that no one need be deprived of this cultural pleasure.

Start Playing Real Tunes, at once!

From the very first lesson you begin to play real tunes, instead of struggling with tiresome scales and uninteresting finger exercises, you hear yourself actually playing songs you know and love, as easily as you now whistle or sing them! If you make a mistake you know how to correct it yourself.

No wonder people who play are popular! They can always be entertaining, because there is some type of music to please any group of people—or suit any occasion.

Pick Your Instrument

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Hawaiian Steel Guitar
Sight Singing, Trumpet
Piano Accordion
Italian and German Accordion
Voice and Speech Culture
Harmony and Composition
Drums and Traps
Automatic Finger Control
Banjo, (Plectrum, 5-String or Tenor)
Juniors' Piano Course

What IS This "Miracle"?

The secret of the U. S. School of Music system is the simplicity. Clear, non-technical terms any bright child could understand. The lessons come by mail. They consist of complete instructions, simple diagrammatic pictures, and all the music you need. No grinding routine. Study when you feel like it—at home. It is like an interesting game, and in an almost unbelievably short time you find that already you are playing! Jazz, musical comedy hits, movie theme-songs, even classics—you have mastered them all! And a new life opens before you.

FREE PROOF!

It's up to you. If you really want to play—send the coupon below. A FREE Demonstration Lesson will be sent to you, with an illustrated book which describes the famous U. S. School of Music "print-and-picture" method of learning.

Mail the coupon today. Mention the instrument you want to play. Then judge for yourself when you receive the free lesson. U. S. School of Music, 2626 Brunswick Bldg., New York City.

U. S. SCHOOL OF MUSIC
2626 Brunswick Bldg., New York City

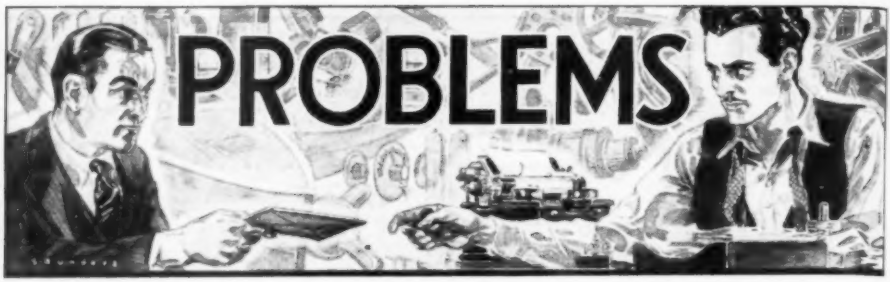
Please send me your free book, "How You Can Master Music in Your Own Home," with inspiring message by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

Have you Instrument? .....

Name .....

Address .....

City ..... State .....



Readers' problems are discussed here for the benefit of everyone.

THREE COFFINS OF TREASURE

Is it possible to build a radio "detector" that will locate gold and silver money buried about eight feet in the earth?

Before the Civil War my people owned a thousand slaves. They were wealthy, and had 30,000 acres of land. After General Sherman burned Atlanta he headed up towards our plantation. My grandfather was at home, being too old to fight. I was 15 then.

Grandfather and I, with two buck negroes, put about five bushels of gold and silver money in a coffin. (We made our own coffins to bury slaves in.) We filled two more coffins with silverware, hauled it to a field about two miles away on an ox cart that night, and buried it.

Grandfather was killed in a skirmish with the soldiers next day, and I was hit in the hip with a Minnie ball. I was in bed for five months. By that time the rains and sand had completely covered the spot, and to this day no one has located the coffins. I know within about one-half mile where it is.

I would like to locate that treasure soon, and get around a little while I can.—Southerner.

Radio treasure finders will locate metal if not too deeply buried. There is a chance of your locating this treasure with one of the commercial outfits which depend upon variations in pitch of an oscillating signal.

Addresses of manufacturers of treasure finders can be obtained from this department.

* * *

GRINDING NOISE IN CAR

At speeds of around 25 m.p.h. my car makes a terrible grinding noise. It seems to be in the transmission, but I've put in new gears and very thick oil with no improvement.—J. W. L., Hot Springs, Texas.

It is very probable that the trouble is in the differential. The gears there are grinding to pieces, and the noise is carried to the transmission by the drive-shaft. Jack up one rear wheel, run the car slowly in high, and listen near the rear axle.

* * *

HOT AIR BALLOONS

Is it possible to make a hot air balloon that will take me high enough for a parachute jump?—L. F. H., Minneapolis, Minn.

Mr. Harold Groves, of Coeur d'Alene, Idaho, will be glad to answer your questions on hot air balloons and parachute jumping. He has had 15 years of experience as a 'chute jumper from both balloons and planes.

Remember the courtesy of a stamped addressed envelope.

* * *

NAVAL COVER COLLECTIONS

I want to make a collection of letters cancelled on U. S. Navy ships. How can I get started?—M. V. C., St. Louis, Mo.

Send stamped addressed envelopes to the postmasters of the various ships. Route your letters through either New York or San Francisco, depending on whether the ship is on the East or West coast. Many U. S. ships have artistic colored postmarks.

Information on a naval cover collecting club can be secured from H. J. Lindhardt, 1106 10th Ave., Los Angeles, Calif.

* * *

HOW TRAINS ROUND CURVES

When a locomotive hits a curve, where one track is longer than the other, do the wheels slip? —G. H., New York, N. Y.

The diameter of a locomotive drive wheel is greater near the flange. Centrifugal force at curves makes the outer wheels ride on their greatest diameter, and inner wheels on their least, offsetting the difference in track lengths. There is some slippage at slow speeds. This slipping of wheels can be observed as a screeching noise when street cars turn a corner.

* * *

SCREW CUTTING LATHE PLANS

Is it possible to make a bench type screw cutting engine lathe at home, with ordinary tools such as drill press, hack saw, and grinder?—J. B. R., Ames, Iowa.

An engine lathe, meeting your specifications, which will handle work up to seven inches in diameter and eighteen inches long can be built from blueprint plans available here at $2.00. Complete materials list and building instructions are included.

* * *

(Editor's Note—All letters sent to this department should include a stamped addressed envelope. Write to Problems Editor, 529 So. 7th St., Minneapolis, Minn.)

MALE HELP WANTED

MEN WANTED at once to call on stores with newest line self-selling 5c and 10c necessities. Strong, original counter displays. Aspirin, Mercurochrome, razor blades, household cement, etc. Automatic sellers. Many new items. Up to 125% profit. Big catalog Free. Procopax, Dept. 95-X, 1956 S. Troy, Chicago.

MEN With Cars needed immediately to fill vacancies local grocery routes. Wonderful chance to make $7.50 a day. Steady, year 'round earnings for ambitious men. Write Albert Mills, Route Mgr., 4511 Monmouth, Cincinnati, O.

JOBSEEKERS and salesmen: Make yourself the outstanding man and you'll be a winner. Valuable hints on applying for employment, holding your job, sales psychology, etc. Price $1.00. Data Service, 3002 Monroe, Kansas City, Mo.

MALE—INSTRUCTION

DETECTIVES. Work home or travel. Experience unnecessary. Write, American Detective Institute, 2640-T, Broadway, N. Y.

MANUFACTURING

METAL Articles developed and manufactured. Model making. Reasonable price and first class workmanship. W. F. Meyer Company, Bedford, Indiana.

MERRY-GO-ROUNDS

MERRY-GO-ROUNDS—New and Used Outfits—Catalog 10c. "Mooremade". LaPeer, Michigan.

MISCELLANEOUS

MAGIC FLOAT creates fun. Wonder Mouse. Samples both 25 cents. C. Prouse, Cambridge, Maryland.

SEND 10c for sample copy, Personal Movies Magazine, Canton, Ohio.

FUN galore shocking persons that touch your car. Send 25c in coin or money order for complete illustrations. Southview Electric and Battery Shop, Southview, Pa.

WARTS removed by yourself. Instructions, dime and stamp. Guaranteed. J. Cochrane, 962 54th St., Brooklyn, New York.

MEXICAN hand made feather pictures. Send 25c (stamps) for $1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

NOTICE Railroad Operators. Miniature steel rail, spikes, ties, gauges, roadbed material, blue prints. Send thirty-five cents for samples, price list and club plan. The Miniature Construction Co., Middleboro, Mass.

MODELS

YOUR Ideas developed into practical, working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T. Cincinnati, Ohio.

1/6 HORSEPOWER featherweight gasoline motor. Gasoline driven Model Airplane and Boat Plans. Send dime for specifications. Mechanical Research, 4305 Augusta, Chicago.

MODEL MAKERS

THE MODELMAKER. The Magazine for those interested in building model railroads, boats, engines. Send 15 cents for copy. Modelmaker Corp., 330M West 34 Street, New York, N. Y.

MODEL MAKERS—Brass, copper, fibre, steel and aluminum in all shapes, also castings, gears, screws and fittings. Catalog 10 cents. Experimenters Supply House, Dept. M, Box 10, Station Y, N. Y.

MODELS & MODEL SUPPLIES

BIG - New - Catalogs - No. 34. Engines, Models, Machinery, Castings, Blueprints. No. 35. Materials-Supplies. Either postpaid 20c, coin or stamps. Foreign countries, 30c. Refunded first order. Illustrated circular Free. Evray Mechanics Supply Co., 28 N. Clinton St., Chicago.

MOTORS

CONVERT your Model A Ford motor for aircraft. Set of parts $36. Circular 10c. Rasmussen Motors, 526 Hickory, Niles, Michigan.

MOTORCYCLES

MOTORCYCLE Bargains, lowest prices, bargain sheet for stamp, motorcycle accessories, largest line in America, lowest prices. Largest motorcycle mail order house in the United States. Rochester Harley Davidson Corporation, 129 West Main St., Rochester, New York.

SEND 15c for illustrated used Motorcycle catalog. Large stock. Bargains. Indian parts. Accessories. Indian Motorcycle Sales, Kansas City, Missouri.

MOTORCYCLES, BICYCLES & SUPPLIES

MOTORCYCLES $25.00. New tires $3.95, used tires $2.50. Engines for airplanes, ice sleds, boats. Boys' automobiles $10 to $75. Pumps, frames, forks, cylinders, crankcases, handle bars, tanks, wheels. 3 speed assemblies, chains $1.50. Wheels for airplanes, boys' automobiles, motorcycles $1.00. Bicycles $11.50. Motor bicycles $45.00. Bike tires 80c. Save you dollars at Deninger Price Cutter, Rochester, N. Y. Send 10c for bulletin.

MOTOR WINDING DATA

MOTOR winders: winding data, 100 A.C. motors, special selection, various horsepower and voltage, $1.00. Motor Data Service, 3002 Monroe, Kansas City, Missouri.

MOTION PICTURES

LEARN Motion Picture Theatre Business. Catalog M. Free. Theatre Institute, Elmira, N. Y.

MOVIE CAMERAS FOR SALE

BARGAINS in 8-9½-16-35mm equipment, parts, film, library, catalog. Mogull, 1944-G Boston Road, N.Y.C.

NOVELTIES

HOMECRAFTSMEN! 8 lawn ornament patterns, 25c. Novel Arts Ltd., Box 100, St. James, Manitoba, Canada.

PAINT

AUTOMATIC Paint—Forms beautiful designs on household articles. G. Cook, Box 204X, Milford, Mass.

PATENTS

PATENTS—Reasonable terms. Book and advice free. L. F. Randolph, Dept. 341, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building.

PATENT your idea. Other men have read and profited by our free book, "How to Obtain a Patent." Fully explains many interesting points to inventors and illustrates important mechanical and electrical principles. With book we also send free "Record of Invention" form. Prompt service, reasonable fees, deferred payments, thirty-five years' experience. Avoid risk of delay. Write immediately to: Victor J. Evans & Co., Registered Patent Attorneys, 647G, Victor Building, Washington, D. C.

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 582 Enright, St. Louis, Missouri.

GET your own patents; legal blanks, complete instructions $1. Cudding Sons, Campbell, Calif.

PATENT for sale, automatic, backstop for automobiles. Apply O. Bjork, Box 401, Kamloops, B. C., Canada.

PATENT ATTORNEYS

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trademark practice. Write for my free book containing valuable information relating to patent procedure. Clarence A. O'Brien, Registered Patent Attorney, 28-B, Adams Building, Washington, D. C.

PATENTS FOR SALE

OUTRIGHT or royalty, new sensational "fountain comb" for beauty parlor and home use. P. Fotza, 1121 No. Wood St., Chicago.

PHOTO DEVELOPING

FILMS developed 5c per roll; prints 3c each. Ask for Special Bargain List. Roanoke Photo Finishing Company, 159 Bell Avenue, Roanoke, Va.

COLORED enlargement with each film developed, printed 25c. LaCrosse Film Company, LaCrosse, Wis.

FILMS developed and printed, 30 cents. Glossy Prints. Western Photo, Toledo, Ohio.

PIANO TUNING

PIANO Tuning learned at home quickly. Tremendous field! Have a year-around business of your own. Be independent! Information free, write Wood's School of Piano Tuning, 606 East University Ave., Champaign, Ill.

PISTONS

ALLOY Pistons. Harley, Henderson, Indian, Excelsior. Used parts, catalogue and wings pin 10c. Ballak, 100 N. 12th, St. Louis, Mo.

PROPELLERS

PROPELLERS: Fords, $8.00; Henderson, $5.00; H. D., Indian, $3.50; Hubs, Wheels, Airplanes, Motors, Blueprints. Lists 10c. Retz Aero Shop, Farmland, Indiana.

PRINTING

250 LETTERHEADS, 250 Wove envelopes printed and mailed $3.00. Samples printing free. Sunko, Mohawk, New York.

COMPLETE printing outfits. Type, ink, paper, and supplies. Write for catalog. Kelsey Co., D-57, Meriden, Conn.

SELECT Printing, 250 letterheads, 250 envelopes, $2.90 postpaid. Regal Printing, Plattsburg, Mo.

FOUR color, 8½x11 letterheads, envelopes; 250 each $1.85 postpaid. Kolorprint, 7214 Duluth, Cleveland, Ohio.

STATIONERY, Circulars, checks, loose-leaf, magazine bindings photo-engraving. Commercial Press, Batavia, Ohio.

PRINTING

250 ENVELOPES, 250 letterheads $2.50. Money order. Wilson, 323 W. 17th, Anderson, Indiana.

RADIO

BE RADIO Operator! Send stamped envelope for details. Radio Information, Box 1942, Seattle, Wash.

COMPLETE blueprint plans for one tube converter that brings in short wave programs on any radio sent for 25c postpaid. Many other radio blueprint bargains listed in new Modern Mechanix Blueprint booklet, sent free on request. Modern Mechanix Publ. Co., 529 So. 7th St., Mpls., Minn.

GUARANTEED pocket radio, $2.00. C.O.D. Shipments made. Catalogue, 10c. Neil Tasker, Shamokin, Pennsylvania.

SHORT Wave Sets, Kits, Supplies. Wholesale Catalog 10c. Federal Telegraph, 4222 Clifford Road, Cincinnati, Ohio.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

NEW! DIFFERENT! AUTOMATIC Time Switch. Turns radios, electrical appliances on or off any desired time. Never fails. Easily made for few cents. Illustrated Instructions 20c. Box 232, Newark, New Jersey.

ENJOY Short Wave Reception. One tube set $4.75, two tubes $6.00. Complete with coils. Others built to order. Send stamps for drawings of any. Satisfaction guaranteed. Virgil Darnell, Emerson, Georgia.

SUPER Selective Crystal Set plans 10c coin. Bercaw Radio Labs., 1024 Burt St., Springfield, Ohio.

SENSATIONAL 1-tube "Shortwaver." Blueprints, dime. Thomas A. Blanchard Labs., Reading, Penna.

RAZOR BLADES

RADIUM tempered super-fine blades, 10 for 25c. Techno, 5218 Race, Philadelphia, Pa.

REAL ESTATE

OZARKS—Five acres timbered river frontage, fishing, boating, pearling, shooting—$100, $5.00 monthly. Hubbard, 224 Grossman Bldg., Kansas City, Kans.

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JUST OUT! World's greatest "Herb Almanac." Beautifully illustrated in natural colors. Contains over 500 old-fashioned herb medicine recipes and Indian secrets for home use. 10c (coin) postpaid. Worth dollars! Bontanics, 145 W. 112th St., Chicago.

RUBBER STAMPS

METAL Stamp outlasts rubber. Name and address, 3 lines, 35c. J. Schwenk, 203 Eustis Bldg., Minneapolis, Minn.

SALESMEN WANTED

MAKE Big Money steady, high grade coveralls, shopcoats, pants, shirts, summer suits. Advertising on back. Fast sellers. Prospects everywhere. Free outfit. Strong Mfg. Co., 901 West Jackson, Dept. C-6, Chicago.

MAN Wanted for Rawleigh Route of 800 families. Write immediately. Rawleigh Co., Dept. F-Sa-MOM, Freeport, Illinois.

LOSING Half Your Gasoline? Wonderful new improved Gas Economizer; 3½ million older models sold. More efficient than ever. Big profits. Free Sample offer. Write quick. Stransky, Dept. 255, Pukwana, So. Dak.

TATTOOING OUTFITS

ELECTRIC Tattooing Outfits, $5.85, full Instructions included; for Catalog write direct to Chicago Tattoo Supply House, 651C South State, Chicago.

TRAILERS

BOOK of camp trailer plans containing 15 modern designs ranging from 8 to 16 feet, copy sent postpaid for $1.00. Toellen Trailer Service, Box 25, College Park Sta., Detroit, Mich.

VENTRILOQUISTS

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room 610, Peoria, Ill.

WELDING

TRADE—Sell or Buy. We have Welding Outfits, Electric Drills, Grinders, Fans, Motors, Dynamos, Wrench Sets, all kinds, Tool Boxes, Spraying Outfits, Gasoline Engines, Woodworking Tools, Typewriters, Firearms, Vacuum Cleaners, etc. Tell us your needs and what you have to trade. Enclose 25c for bargain list and a clever idea for a quickly built, modern camping trailer. C. W. Carlson, 2212 Grand Ave., Omaha, Nebr.

ARC WELDER can be built from light plant generator. Will handle 5/32 rod. Blue prints and instructions that any one can understand $2.50. Byron Brown, Echo, Ore.

Chips From the Editor's Workbench

(Continued from page 17)

writer. This little ship won the Polish Trophy race at the American Air Races held in Chicago last July at an average speed of 114.92 m.p.h. around a five-mile triangular course. This was a 25-mile race. It easily defeated all ships entered including a Heath Bullet and a special clipped wing job sent over by the Heath Co.

The Tilbury Flash has a top speed of 140 to 150 m.p.h., landing speed of 60 to 65 m.p.h., wing span of 17 feet, overall length of 12 feet 6 inches, and overall height of 4 feet 6 inches. Contrary to the average race ship, this plane actually flies hands off in the air. The motor used is a Church Marathon J3 which develops between 35 and 40 h.p.

At the International Air Races last September the Tilbury Flash took 2d place each day in the 200 cu. inch race. On the way to Chicago after leaving the Joliet airport a valve broke and knocked the cylinder head off. The pilot turned and came back a distance of 10 miles, using the three good cylinders and hoping the motor would not vibrate out of the ship. He made it Ok. The cylinder was replaced and flown to Chicago the next morning.

Owen R. Tilbury.

This "Tilbury Flash" is probably the smallest ship in the world and, the designer claims, the fastest in her class.

Wasn't that a happy landing for a keen little flying ship?

* * *

Two of our regular readers hastened to check up an MM correspondent who said in the April issue, page 53, that Piedmont, Calif., had installed the first two-way police radio equipment. One came from Guy A. Stewart, Jr., fire commissioner of Eastchester, N. Y., the other from Charles J. Bodnar, of the Radio Engineering Laboratories, Inc., Long Island, N. Y. Both stated that Eastchester was first to install two-way police radio. The system was put in operation May 23, 1933.

* * *

Stray chips . . . At last—a wind generator that will light a home. Turn to page 96 . . . MM's March cover and lead-off feature, "Radio Outlaws to Broadcast from Super Stations at Sea" was a big scoop. Two months after the issue appeared on the stands Dr. John R. Brinkley's station XER was outlawed from Mexico. As this goes to press he is planning a broadcasting station on the high seas . . . In the Sportsmen's Campfire this month Robert Page Lincoln tells you about the best fishing tackle and next month he will tell you how to use it . . . You Latin scholars should enjoy that Rome model on page 45.

ATLAS 9" LATHE

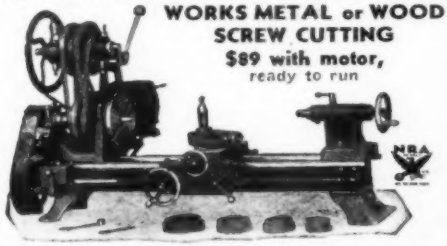
$79 Cash or 10 Months Terms—

Spend long happy winter evenings with this fine, precise tool which lets you do all sorts of jobs in metal and wood that you couldn't touch without a lathe tested to 1/1000" accuracy. Ideal for making models, etc. Small down payment, then 10 months to pay off the balance.

Uses ¼ h. p. Motor—Economical to Run

All modern; self-contained countershaft, no shafting and pulleys necessary; patented V-belt drive; 45 parts of Zamak alloy, twice as strong as cast iron. 6 speeds; 18" between centers. Also larger sizes at similarly low prices. Plugs into light socket. Screw cutting, 4 to 72 threads per inch. Compound rest, automatic, reversible feeds, hollow spindle. Strong, sturdy. Bed of finest cast iron, seasoned, accurately machined and ground. Try it 10 days, money back if not satisfied. Tools and attachments at very low prices, also. Write for free catalog giving all details, to

ATLAS PRESS CO.
1852 N. Pitcher St. Kalamazoo, Mich.



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Times are getting better. Trained men are getting jobs. National will quickly train you to qualify for good jobs in all branches of radio, television, talking pictures, broadcasting, operating and general electricity. Thorough, practical training. Over $100,000 in modern equipment. National graduates in demand. Regardless of age or education you can learn profitable trades in a few months. Shop and studio practice.

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Control Operator
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75% of our students earn living expenses while receiving training. We help you get a job. For limited time will allow your coach railroad fare to Los Angeles.

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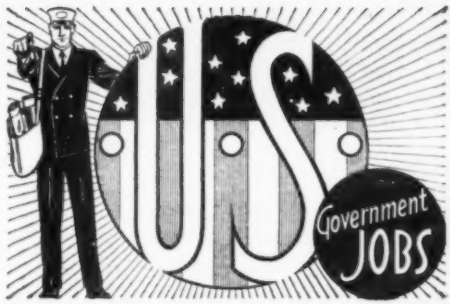
This is the Ideal City. Center of Greatest Activity in Radio, Talking Picture and Electricity. 30,000 successful graduates. School established 29 years. Send for free descriptive book and enrollment details.

NATIONAL RADIO & ELECTRICAL SCHOOL · Los Angeles

Dept. MMR-6, 4006 Figueroa St.,
Send Book and full details of Courses.
NAME.....
ADDRESS.....
CITY.....STATE.....



Start $1260 to $2100 a Year

PICK YOUR FUTURE JOB

MEN, BOYS—18 to 50

Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is quickly increased in normal years, the maximum being $2,700 a year. ($112.50 each pay day.)

3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now commence at $1,700 a year and in normal years automatically increase $100 a year to $2,100 and $2,300.

Customs and Immigrant Inspector

Salary, to start, $2,100. Men 21 to 45. Work connected with examining immigrants and merchandise entering the country from foreign parts.

Early examinations expected

Many early examinations are expected and those wishing positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a life big-paid government job.

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Rush to me entirely free of charge (1) a full description of the position checked below; (2) Free Copy of 32-page book, "How to Get a U. S. Government Job"; (3) A list of U. S. Government Jobs; (4) Tell me how to get a Government Job.

- ☐ Railway Postal Clerk ..... (Start $1900 year)
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- ☐ City Mail Carrier ..... (Start 1700 year)
- ☐ Government Clerk—File Clerk ..... (Start 1260 year)
- ☐ Inspector of Customs ..... (Start 2100 year)
- ☐ Immigrant Inspector ..... (Start 2100 year)

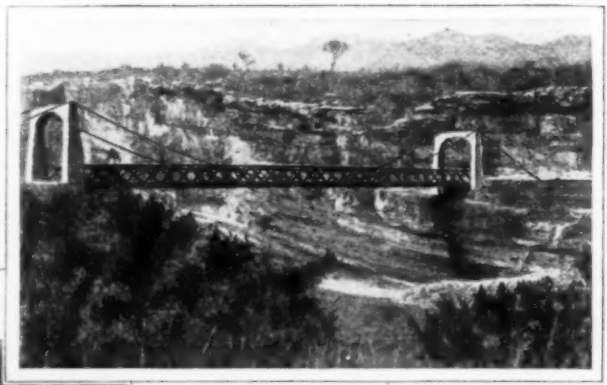
Name .....

Address .....

Use This Coupon Before You Mislay It

Hewing Jungles and Mountains

Triumphing over nature's grim and forbidding barriers, engineers are building a super highway linking Alaska and the Argentine. Here is the story of the greatest road project in history.



One of the new suspension bridges on the Mexican section of the roadway, spanning the Chiapas river.

Crude bridges like that above must be replaced by modern steel structures before the international highway is completed. Present plans call for the building of about 200 new bridges in Mexico and Guatemala alone.

Tourists will revel in the scenery which abounds along the route. Above are shown mounds and temple ruins left by a race of people dating back to prehistoric times.

by **PETRIE MONDELL**

HACKING their way through tangled jungles, braving the quicksands of treacherous streams, hauling equipment by sheer man power up towering cliffs and over once impassable mountain ranges, dauntless engineers are bending every effort to bring the mightiest highway in all history to completion. The finished project will link two continents—a Pan-American roadway extending from northern Alaska to the southern Argentine.

South American nations are pushing the work as rapidly as possible. Colombia has almost finished its section; Ecuador, Peru, Chile and Argentina are working on theirs. Hewing routes through certain sections between Mexico and Panama has not yet begun; but President Roosevelt has announced the willingness of the United States government to advance $600,000 to republics whose lack of finances might otherwise halt the work.

United States engineers, under E. E. East, have already laid out most of the routes; and were first to fight their way through the high Barranca section in Mexico, which has previously cut off Mexico City from overland communication with the Mexican west coast. East and his men, facing untold hazards, fought their way through the hitherto impassable section, paving the way for one of the greatest road-building feats ever accomplished.

The Americans entered the Barrancas a little beyond the historic Mexican town of Tepic and emerged on the Guadalajara side two days later. It was a spectacular performance, but the Americans did not rest upon their laurels. They were bound for Salvador, determined to conquer the jungle and prove that North America and Mexico might obtain highway connection with their southern neighbors.

The demonstration was a success. Mexican officials were enthusiastic. Colonel Filiberto Gomez, governor of the State of Mexico, offered bonuses from his own funds

for World's Greatest Highway

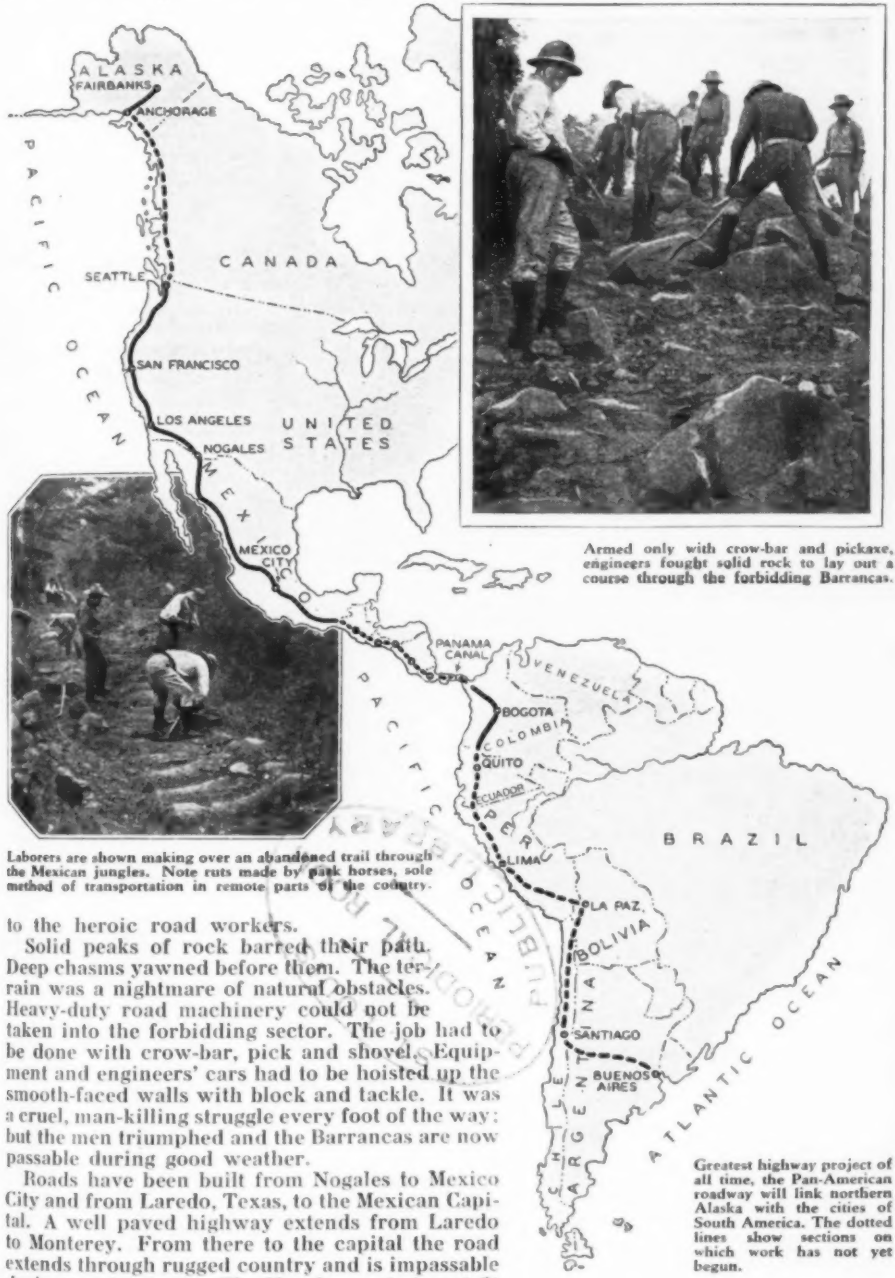
Armed only with crow-bar and pickaxe, engineers fought solid rock to lay out a course through the forbidding Barrancas.

Laborers are shown making over an abandoned trail through the Mexican jungles. Note ruts made by pack horses, sole method of transportation in remote parts of the country.

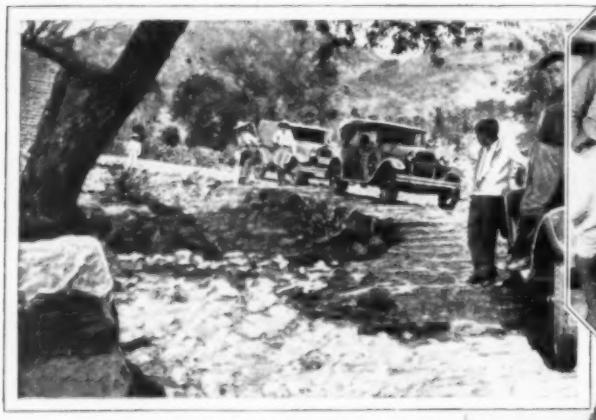
to the heroic road workers.

Solid peaks of rock barred their path. Deep chasms yawned before them. The terrain was a nightmare of natural obstacles. Heavy-duty road machinery could not be taken into the forbidding sector. The job had to be done with crow-bar, pick and shovel. Equipment and engineers' cars had to be hoisted up the smooth-faced walls with block and tackle. It was a cruel, man-killing struggle every foot of the way: but the men triumphed and the Barrancas are now passable during good weather.

Roads have been built from Nogales to Mexico City and from Laredo, Texas, to the Mexican Capital. A well paved highway extends from Laredo to Monterey. From there to the capital the road extends through rugged country and is impassable during most seasons. The Nogales route is not fit



Greatest highway project of all time, the Pan-American roadway will link northern Alaska with the cities of South America. The dotted lines show sections on which work has not yet begun.



More than a century old, this Spanish colonial road will be modernized by highway engineers and made a part of the Mexican section of the great Pan-American roadway.

Type of short wave radio, generator operated, used on the Barranca job.

for travel during the rainy season in the summer months.

In pushing her section of the international highway to virtual completion, Mexico has taken a great step forward in her own behalf. Overland communication between Mexico City and the west coast, once impossible, is nearing reality.

Other nations were quick to follow Mexico's lead. At the Pan-American conference in Montevideo last December the project was unanimously endorsed. More than 400 South American newspapers adopted the road as one of the main planks in their editorial platforms.

The potential value of this super roadway in the Pan-American scheme of things cannot be estimated. It will open up new areas to commerce, encourage international relations, provide emergency airplane landing fields and serve as a defensive weapon in time of war. Short wave radio stations will be established along the route, supplemented by mobile patrols, radio equipped.

The route of the new highway is rich in historic associations. In places it proceeds over trails used by the Conquistadores and over roads laid down by the Aztecs and the Mayans. Paralleling the highway, engineers have found ruins so ancient that archeologists have been at a loss to classify them.

Much work remains to be done before the last link in the international highway chain is forged. Pontoon bridges and ramshackle ferries must be replaced by modern structures.

The roadway has been cut almost to the Panama Canal. With the exception of a 200-mile section from Panama to Sona, a

Man power conquers nature's most stubborn obstacles. Laborers are shown pulling an engineer's car forward with block and tackle in the once impassable Barrancas.

short space between Remedios and Davi' a small strip between San Jose and S Ramon and a section between Las Cana and La Cruz, the highway is open to travel during the dry seasons.

Another strip of 200 miles from San Jose in Costa Rica to the little town of Volcan is yet impassable but President Roosevelt's offer of funds is expected to help complete the unfinished work. Within eighteen months, authorities estimate, the great roadway will be open to the Panama Canal.

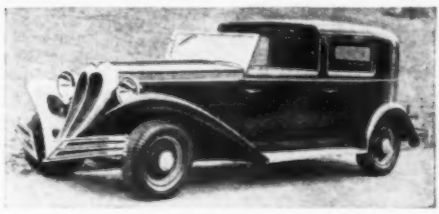
The South American sections will require about three years to complete; but it is hoped that within five years the first inaugural caravans will start from Alaska, en route to the Argentine, to celebrate the greatest highway project in all history.

Ford - Rolls Royce Merger Creates a Striking Luxury Car

THE world's strangest auto merger has been effected—a Ford engine in a Rolls Royce body. The result is a startling new car which will shortly make its appearance on American highways.

Powered by an ordinary Ford V-8 engine, the new car is mounted on a converted Ford chassis. The aristocratic body has been designed and built by engineers of the American Rolls Royce company. The car will sell for $3,640.

The car has a 127-inch wheelbase and is fitted with "booster brakes," improved springing, special radiator, thermostatic shutter control and numerous other features which improve on the original chassis and lift it into competition of the "luxury car" field.



Here is the year's most sensational automobile, a custom-built town car powered by an ordinary Ford V-8 engine. Rolls Royce body is mounted on a converted Ford chassis.

Freight Car Holds Four Autos

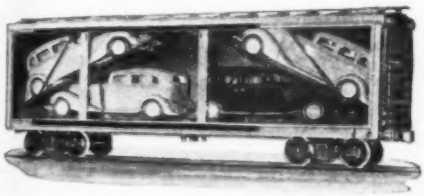
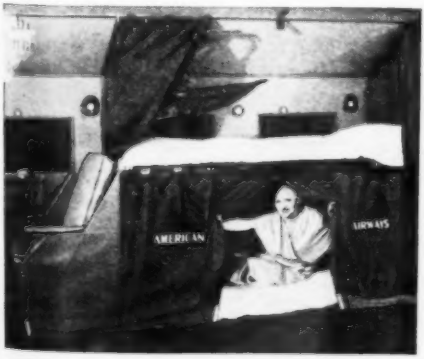


Photo shows how steel framework permits two cars to be elevated to the roof, leaving the floor space clear and doubling the loading capacity of automobile freight cars.

DESIGNED to increase loading space, a new apparatus permits storing four automobiles in a box car which once accommodated two. The device consists of a steel framework which elevates two cars to the roof, leaving floor space clear.

Two men can load and unload the cars without tools. The framework locks against the roof when not in use, permitting the shipping of other commodities.



Roomy lounge chairs are quickly converted into comfortable berths for overnight travel aboard the new air liners.

Swimming Taught by Telephone

BY MEANS of a special headset and transmitter, a San Francisco coach is teaching swimming via telephone. The instructor stands on the edge of the pool and relays advice to his pupil in the water.

Specially prepared, waterproof transmitters and receivers, plus a length of telephone wire, comprise the set which operates on a charge of three volts. The advantage of the device is that faults are corrected while the swimmer is in action.

The inventor of the swimaphone tests his apparatus before sending his fair pupil out into deep water for instruction.

Air Liners Have Berth Facilities

GIANT air cruisers, equipped with comfortable sleeping quarters, will soon take flight, to mark another forward step in aviation. Each plane will have six compartments which may be converted into upper and lower berths.

These berths are longer than those in standard railroad sleeping cars and are furnished with reading lights, individually controlled air heat and the customary berth accessories. When not used for sleeping purposes, the berths are made into comfortable lounge type chairs as shown in photo, left.

A VISIT INSIDE UNCLE SAM'S *New*

by JAMES NEVIN MILLER

Built to withstand fires, bombs and the raids of super criminals, the nation's newest treasure house is the last word in safety. Here are the reasons why.

UNCLE SAM'S new gold vault is the greatest and strongest fortress in the world. No fire can harm it. No bomb can damage its mighty walls. The most brilliant cracksmen cannot penetrate its baffling defenses.

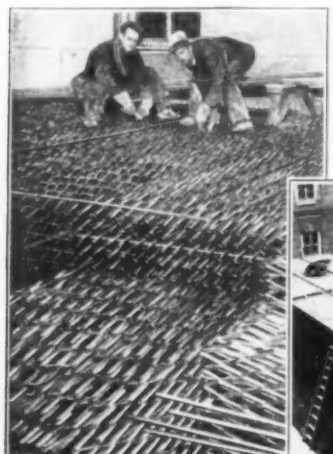
Built of steel and concrete whose strength is unbelievable, this giant treasure house is equipped with mysterious passageways, secret doors and an automatic alarm system whose scale is the largest ever conceived by the mind of man.

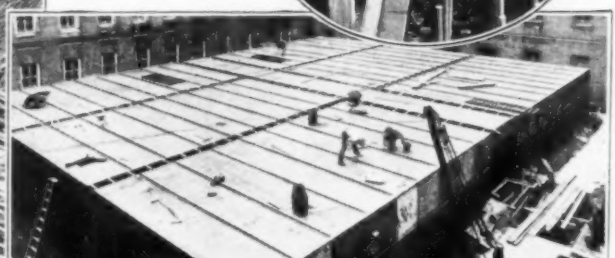
More than twice the size of the old vault, the new structure is capable of housing all the gold in the United States—three billion dollars in bullion—the greatest concentration of wealth in American history. Erected upon the site of the old vault which was razed a year ago, the new treasure house is literally a building within a building. Nestling in a courtyard, it is surrounded on all four sides by the heavy stone walls of the old Treasury Building.

Actually the new vault is two vaults in one, or rather, two major vaults, one located on the lower story and the other on the upper, each in turn divided into sub-vaults. The lower story is sectioned off into a corridor running through the center and facing at either side on ten sub-vaults.

This story is entered from the sub-basement level on the northeast corner. Facing the entrance is a giant steel door weighing thirty-nine tons. According to Treasury engineers, it would take a dozen of the country's best experts on vault design and construction at least seventy-three hours to penetrate to its insides in case somebody lost the combination.

Assuming that by some near-miracle a safe-cracker did succeed in getting inside this giant door, it would take him at least three days to crack his way, via acetylene torch or compressed air apparatus, into any one of the doors leading into the sub-vaults.

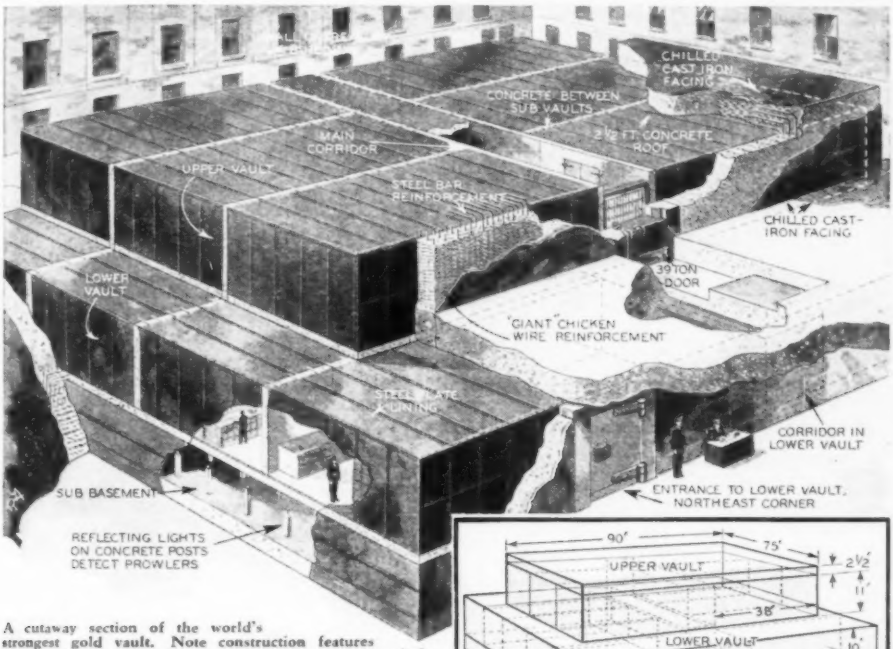




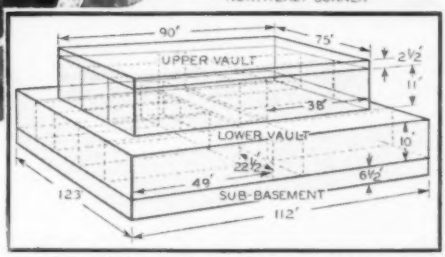
Left, workmen lay a bombproof roof of giant "chicken wire." Right, concrete poured over these steel bars and webbing is later faced with chilled cast iron to form the structure's exterior surface.

Completing the laying of the chilled iron facings. This metal, one of the strongest known, is so hard that it cannot be cut or shaped after it is cast.

GOLD VAULT *Fortress*



A cutaway section of the world's strongest gold vault. Note construction features and numerous other safety devices which protect America's wealth against bombers, firebugs and marauding thieves.



All the gold in the United States—$3,000,000,000 in bullion—may be stored in these twin vaults. Both are identical in construction detail with the exception that the upper vault will be further protected by erection of a concrete roof which is to be two and a half feet high.

Each of these latter, by the way, has only one lock; but the door will not open unless two keys are used. These will be carried, it is understood, by two separate guards. Assuming that both these men lost their keys there's a secret emergency entrance to each sub-vault, known only to a chosen handful of Treasury executives.

When the main vault is put into actual use, guards will patrol the corridor night and day. Every sub-vault is air-conditioned and equipped with what is believed to be the most efficient automatic alarm system ever known. Details are naturally not available to the public, but it is understood that if any person so much as touches a door outside of office hours, an alarm will immediately bring secret service operatives and police to the scene instantly.

This lower vault, or story, is almost an exact square, 123 feet by 112 feet. The ceiling is 10 feet high and each sub-vault is 22.6 feet by 49 feet. Somewhat smaller in length and width is the upper story. Instead of ten sub-vaults it has only six. Each is equipped for storing securities, currency or coin, as the emergency may arise.

Every piece of major equipment in this upper vault is exactly like that in the lower vault, including the thirty-nine ton entrance door, the corridor down the middle and the unique automatic alarm system. The only substantial difference is that on top of this vault will be built a concrete roof two feet six inches high.

Immediately underneath the lower vault is located what is unquestionably the strangest subterannean passageway ever constructed in modern times. Made of strongest concrete, it has a ceiling only six and a half feet high. The entire section is composed of what are termed "intersecting inspection ports." These ports, spaced at intervals of about two and a half feet, are simply upraised chunks of concrete reaching to the average man's shoulder. Each one

(Continued on page 137)

Novel Parachute Plane Is Built to Land in the Back Yard

Recently tested in Chicago, saucer plane made 135 m.p.h. and landed like a parachute.

FIRST cousin to the autogiro, a new circular-wing airplane recently tested in Chicago is so simple in operation that one who has never been off the ground can learn to fly it in thirty minutes, according to the inventor.

Instead of the conventional wing structure, the new plane has a huge saucer-like disc trussed above the fuselage. At the rear of the wing are two ailerons which enable the plane to land at low speeds.

A small 110-h.p. Warner motor develops a speed of 135 miles per hour. The ship climbs at an angle of 45 degrees and lands at a speed of 25 miles per hour, coming to a halt within a few feet.

The plane's peculiar fifteen-foot wing is attached to a conventional fuselage by braces like those of the usual high wing monoplane. The ship carries two passengers and can be housed in a hangar not much larger than the ordinary garage.

The invention of Steven P. Nemeth, former aeronautics instructor at McCook Field, the plane is virtually stall-proof, foolproof and can land on any kind of field.

Device Makes Typewriter Add

A NEW calculating device, quickly attached, makes an adding or billing machine out of any standard typewriter. Keys of the typewriter operate the calculating mechanism. The machine simultaneously adds or subtracts as fast as the keys are struck and can be easily operated by anyone who can use a typewriter.

Left, a closeup of the calculating device which is easily attached to any typewriter. A lever disconnects the mechanism when it is not in use.

Horizontal Bike Is Speedy

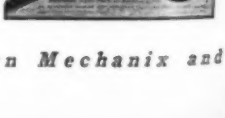
Something new and speedy is this new horizontal bicycle, developed by a French rider. The cyclist's position adds speed through greater leverage and less wind resistance.

EXPERIMENTING with various types of machines led Francis Faure of Paris to the development of a horizontal bicycle. The position of the rider affords great leverage and enables its inventor to attain great speed in trial spins.

Roller Kit Holds Abrasive Cloth

A CLEVER roller device holds a spool of abrasive cloth which may be torn off in convenient lengths for various household repair jobs requiring cleaning or sharpening.

Fed from a roller as shown in photo, the cloth may be torn off as needed. Refills are easily inserted in the cartridge chamber shown at right.



Form YOUR CLUBS NOW! *Join* MM's INTERNATIONAL *Workshop Society*

WHAT THE INTERNATIONAL SOCIETY OF MODERN MECHANIX AND INVENTORS OFFERS

1. Membership in an international organization, devoted to the interests of home workshop activities, science, mechanics, and inventions.
2. Affiliation without any dues of any kind.
3. Charters open to groups of five or more persons.
4. The prestige of Modern Mechanix and Inventions as the official magazine of the International Society of Modern Mechanix and Inventors with a special section devoted to activities of clubs in the Society.
5. Special contests and projects for clubs and members.
6. An information bureau to answer any questions or problems.
7. Special discounts on subscriptions to Modern Mechanix and Inventions.
8. Workshop blueprints published by Modern Mechanix and Inventions at a discount.

Above—Members of the Nokomis Artisans Club, charter club No. 1 of the International Society of Modern Mechanix and Inventors, grouped around the workshop bench of one of the members. Below—Officers of the Nokomis Artisans Club. Oscar E. Olson (seated) is president and Ormal Sprungman is secretary and treasurer of the club.

IN ANSWER to the demands of hundreds of amateur workshop fans seeking fellowship in a large organization, the International Society of Modern Mechanix and Inventors has been organized. The Society now offers the opportunity of bringing together anywhere in the world those persons whose hobby is making things.

The International Society of Modern Mechanix and Inventors was formed after the Nokomis Artisans Club came to the publishers of MODERN MECHANIX AND INVENTIONS and asked that the magazine sponsor such an organization. The Nokomis Artisans Club of Minneapolis, after selecting MODERN MECHANIX AND INVENTIONS as the official organ of the club, sought to increase the scope of the organization. The club members suggested an international society that would invite the affiliation of similar groups throughout the world.

Any group of five or more persons, interested in home workshop activities, science, mechanics, or inventions, can form a club and apply for a charter membership in the International Society of Modern Mechanix and Inventors.

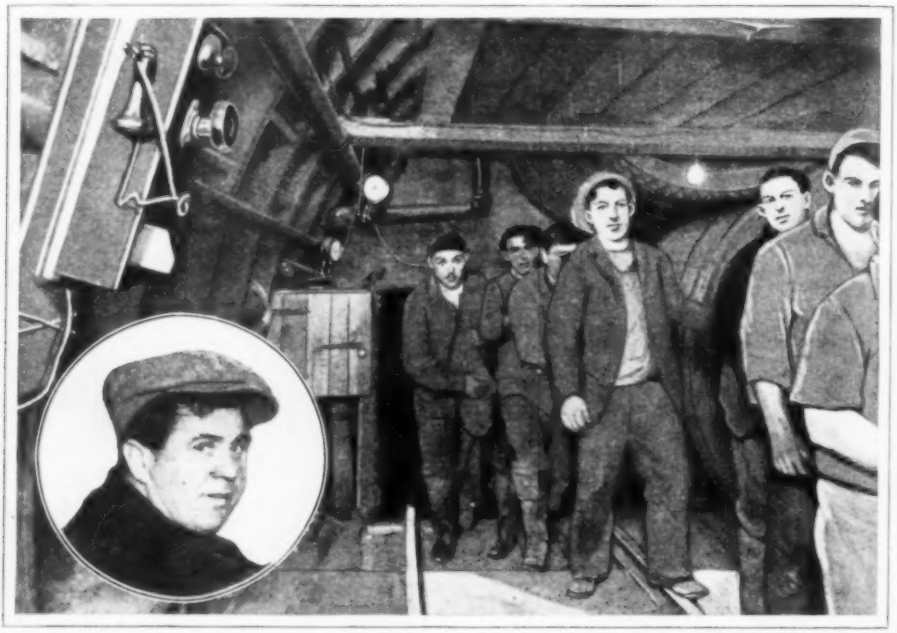
The Nokomis Artisans Club has received Charter Number One. As time goes by and more clubs become affiliated with the Society, it will be considered an honor to have a low charter number. Therefore, if you and your friends are considering forming a club, send in your application for a charter now while the low numbers are still available.

The International Society of Modern Mechanix and Inventors is a noncommercial organization. There are no dues of any kind. If the individual clubs wish, they can levy dues with the consent of their members for carrying on the activities of their organizations. No part of these dues will be sent to the International Society.

Organize your club now to secure the advantages the Society has to offer. Simply apply for an application blank, call a meeting of five or more friends or persons interested in workshop hobbies, elect officers and send in your application for a charter, properly filled out, to the International Society of Modern Mechanix and Inventors, care of MODERN MECHANIX AND INVENTIONS, 529 South Seventh St., Minneapolis, Minn.

(Continued on page 120)

BURIED ALIVE *with the*



Extreme air pressure allows tunnel builders to work only about one hour in five. A crew is shown coming off duty to rest five hours before re-entering the tunnel. Insert shows Walter Redwood, whose career is told in this story.

GROPING along like so many human moles, the Montague street tunnel crew pushed its way beneath the East river, separating Brooklyn and New York City. One moment the big cutting shield was boring steadily forward—the next, disaster struck with the fury of a tornado. The shield had cut through to the riverbed above!

With terrific force the compressed air of the work chamber roared through the slit in the tunnel's weakened ceiling. Three workmen, stationed near the spot, were scooped up by the force of the giant blast and hurled upward. Like shells from a gun they shot through the rift in the ceiling—up through the waters of the East river—to catapult fifty feet into the air with a force that killed two of them instantly.

Next to these "blows," as they are called, the dread of the tunnel digger is the premature dynamite blast. During the construction of New York City Water Tunnel No. 2, driven in parts from 500 to 700 feet underground, over fifty workers and technicians were killed and hundreds were wounded. Yet despite the almost constant threat of death, the workers swear fiercely by their hazardous calling. The heritage of danger is handed down from father to son.

Take the Redwood brothers, for instance—Harry, Norman and Walter—three rugged, death-defying tunnel shooters whose sons are following in their footsteps even as they followed father, grandfather and great-grandfather before them.

The tunnel-building Redwoods are a famous clan. Expert workmen, they are practically without a peer when it comes to sinking a foundation shaft or driving tunnels through mountains or river beds.

Building the Holland Tunnel

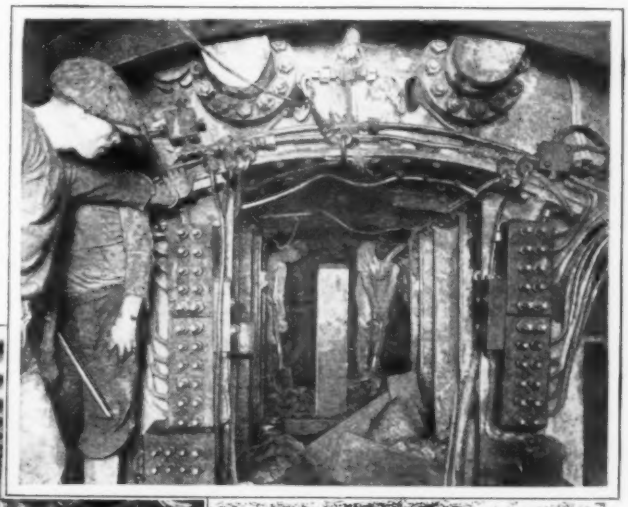
It was Harry and Norman who jointly superintended the famous and extra-hazardous Holland Tunnel under the Hudson River. When the two huge cutting shields were finally joined—one forging its way from the Jersey side and the other from Manhattan—Harry and Norman reached across the submarine and underground boundary lines and shook hands, showing the exact precision with which these men work.

When a representative for MODERN MECHANIX AND INVENTIONS visited the Newark spot where the Passaic river bridge is being caissoned, he found eighteen members

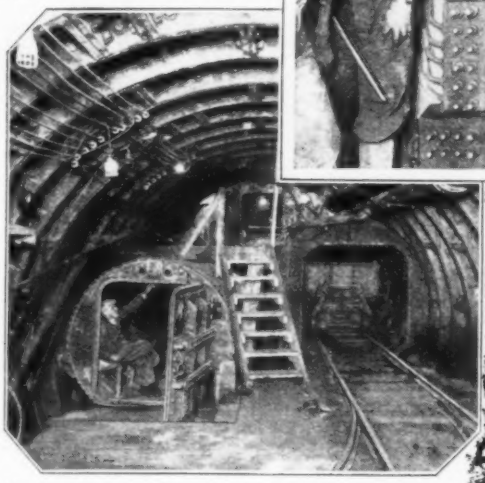
Tunnel Builders

by ALFRED ALBELLI

Deep in the earth, men bore through mountains and under river beds to build our tunnels. Deadly peril constantly stalks them. Here is the thrilling story of their work—one of America's most hazardous occupations.



Right—a rear view of the huge shield which is moved forward by a series of powerful hydraulic jacks.



Above is shown a lock tender with his hand on the air valve which regulates the pressure in the air lock at the head of the stairway. Men enter this lock, where pressure is increased one pound per minute, to adjust their bodies to tunnel conditions. At right, an artist's drawing which shows the work involved in the sinking of preliminary shaft.

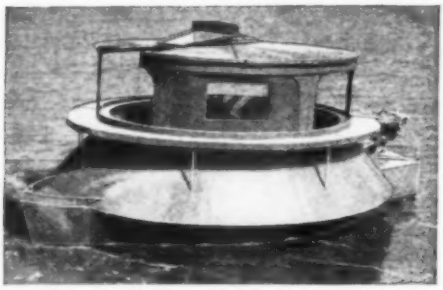
of the Redwood family working there. Walter, the youngest of the three veterans, finally revealed the history of his tunnel-digging family after considerable prompting had overcome his natural modesty.

"My great-grandfather, Robert Redwood, was first of the line of tunnel borers. We originated in England, you know. Then came my grandfather, also named Robert. He worked in the well-known and historic tunnel from England to Severn, under the water to Wales.

"My father, William, came by his tunnel-working inheritance quite naturally, and we have all followed suit. My mother's father was also a tunneler, by the way, and so were her eleven brothers. Our sisters

(Continued on page 121)

Just a Tub and Outboard Motor Made This Odd Boat



Air chambers keep this novel motor boat from sinking. Taken out of the water, the under surface of the boat resembles two large tubs placed together bottoms out. Inside diameter of craft is six feet; outside, eight feet.

DEPARTING from conventional lines, a Missouri boat builder has constructed a novel craft reputed to be unsinkable. Air chambers in the bottom of the boat, plus circular construction, prevent tipping or sinking.

Made of 18 gauge steel, the boat is powered by an outboard motor and steers a straight course despite appearances.

British Build "Elevator" Plane

PLANE designers in England are experimenting with a new ship expected to ascend almost vertically. It will climb 20,000 feet in about nine minutes, whereas World War planes often required almost an hour to reach a similar altitude.

The craft is a new Hawker Super-fury and mounts two machine guns.

U. S. Wins World Outboard Race

SKIMMING over the waters of Lake Worth, Florida, Horace Tennes, Northwestern University sophomore, drove his speedy craft across the finish line to win the final heat of the international outboard races.

Tennes won handily from the European drivers, roaring to victory with nearly a mile of open water behind him.

Photo shows a thrilling moment in the international outboard races held at Lake Worth, Florida, won by Horace Tennes, a young driver from Northwestern University.

CWA Men Find Mastodon's Skull

James Cummings, left, CWA foreman, and Commissioner Charles Townsend exhibit huge skull found in peat bog.

PROOF that mastodons once roamed the middle west was established when CWA workers discovered a huge prehistoric skull in a peat bog near Aurora, Ill. The remains were identified as those of a mastodon, a species of beast that roamed over North America more than 20,000 years ago.

New Spray Gun Attaches to Hose

A NEW attachment for the garden hose eliminates hand pumping or the use of pans and buckets when spraying shrubs, flowers or chicken coops. The gun replaces the nozzle and is equipped with various chemical cartridges for different pests. Each equals 5 gallons of solution.

Attached to garden hose, this spray gun has chemical cartridge fillers which spell death to insects and various parasites.

Model Reveals Glory of Ancient Rome

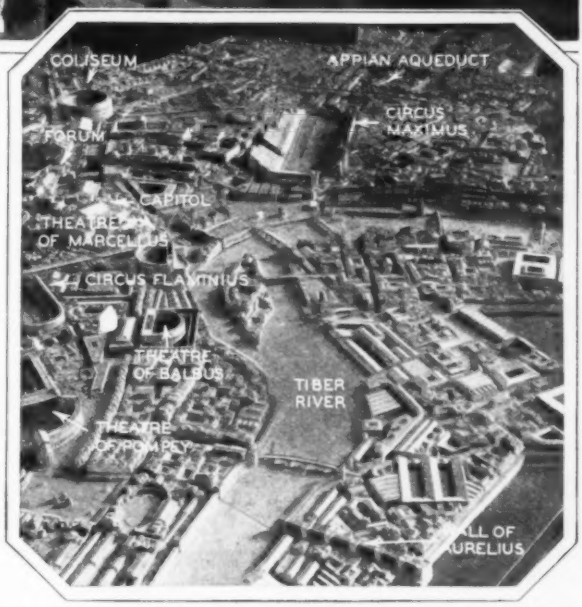
Twenty feet wide and forty feet long, this model of historic Rome, perfect in every detail, took thirty years to build.

BROUGHT to life by an artist's genius, imperial Rome lives again in a remarkable plaster model recently exhibited in the Paris Institute of Art and Archaeology.

Built by Paul Bigot, Academy member, after thirty years of work and study, the model effectively turns back the pages of history to about the fourth century, A.D., revealing Rome at the height of its power under the last emperors. Rising in stately miniature, the walls and towers of the model project vividly bring back the beauty and the glamor of the city which at one time ruled the entire civilized world.

The imposing Circus Maximus, once the scene of great games and gladiatorial contests but now crumbled into rubbish, is restored to its original glory. The stately Forum, where senators met to frame the edicts which changed the course of history, again rears its massive columns. Walls, aqueducts, theaters, roadways—all are represented in most amazing detail.

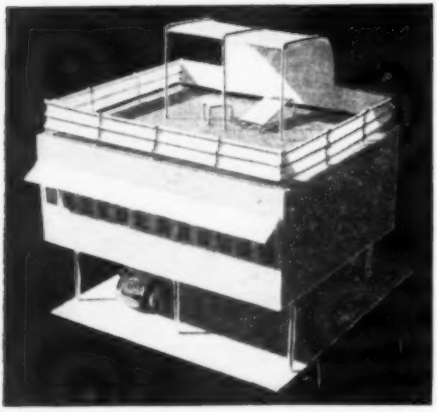
In addition to his own research, which covered half a lifetime, the builder drew upon a host of ancient and scientific manuscripts to aid him in his work. The result is that the location and shape of every sculptured building, shrine or tomb has been checked countless times to insure historical accuracy, down to the smallest bit of frescoed ornament. In fact, the reconstruction is said to be so perfect that virtually every tree and fountain is in its proper place.



If an aviator could have flown a modern airplane over the city of Rome in the days of her greatest triumphs, this is what he would have seen. Note the perfect reproduction of the historical places long familiar to scholars.

Some idea of the magnitude of the project may be had by studying its dimensions. The model itself is twenty feet wide and forty feet long and covers about three-fifths of the area of Rome as it appeared under the reign of the Emperor Aurelianus. Reduced to the scale of the model, this affords reproduction of an area two and one-half miles long and a mile and a half wide. The scale offers approximately the same perspective as that of an aviator flying about a thousand feet above the city.

Canvas House Costing But $1000 to Be Home of Future



Model of new cotton summer house which can be constructed anywhere in country for less than $1000. Open lower floor serves as garage. Top floor is used for sun-baths.

CANVAS is now being considered by architects as an attractive and economical building material for the small homes of the future. Canvas can now be treated with preservative paints to make it waterproof and fireproof.

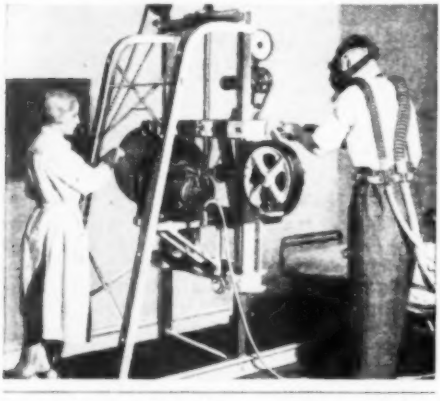
A summer home which can be built anywhere for less than $1000 uses canvas almost exclusively as a surfacing material. The open lower deck, raised one foot off the ground to avoid dampness, is used for garage, storage, and shower bath. The main floor 8 feet above is reached by a folding stairway, as is the sun-deck above.

"Ergometer" Checks Pensioners

DISPUTES between pensioners and government officials at Hamburg, Germany, as to their working capacities are now being settled by the "ergometer," a machine which registers electrically the capabilities of different people for all sorts of work.

The queer machine is first adjusted to the height of the person.

A mask is adjusted over the face to meter the amount of air breathed in and out. The patient then cranks a device which records electrically the amount of work being done. From this reading a fair pension allotment can be found for any person. The machine will expose persons who claim disability when they are too lazy to work.



German "ergometer" machine measures energy used up by patient while doing measured amount of work. Pensions can now be allotted according to working capacity.

Largest Golf Club Weighs 100 Lbs.

Three persons perched atop a stepladder are needed to swing this giant golf club. Head is 36 inches long; club weighs 100 lbs. Ball set on giant tee is 13 inches in diameter.

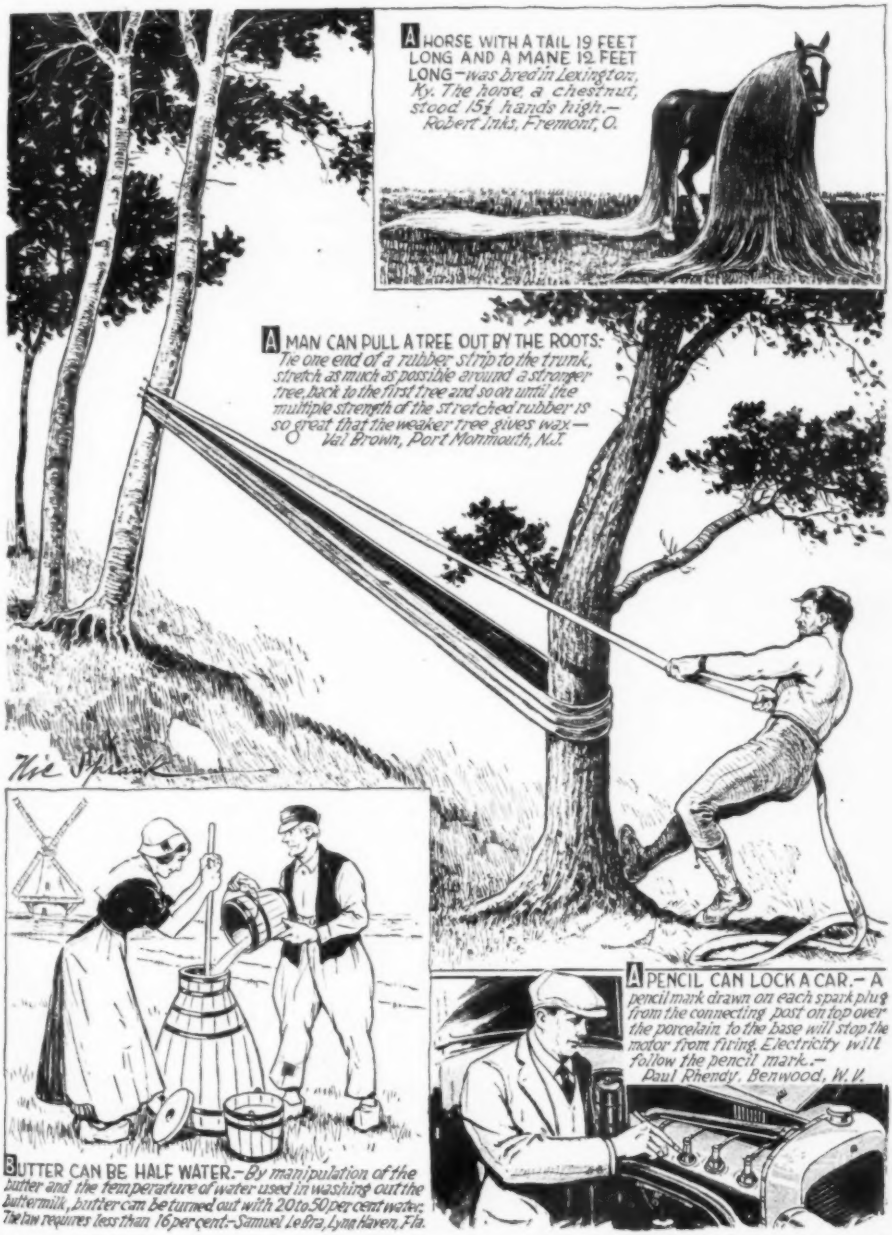
THE world's largest golf club, with a head 36 inches long, and other dimensions in proportion, is being used at opening ceremonies for various golf tournaments in California.

Three players perched on a step ladder are needed to drive off the 13 inch diameter golf ball atop its gigantic tee.

Cheese Now Ripened in Tin Cans

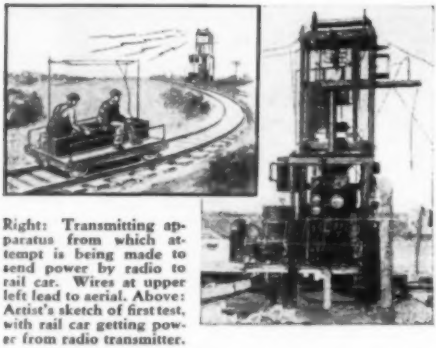
CHEDDAR cheese, heretofore sold only in slices, can now be merchandised in sealed tin cans of convenient size. The green cheese is packed in cans and sealed. A new safety valve permits gases formed during the ripening process to escape.

NIC SPRANK'S ODDITIES of SCIENCE


A HORSE WITH A TAIL 19 FEET LONG AND A MANE 12 FEET LONG—was bred in Lexington, Ky. The horse, a chestnut, stood 15¼ hands high.—Robert Inks, Fremont, O.
A MAN CAN PULL A TREE OUT BY THE ROOTS:—Tie one end of a rubber strip to the trunk, stretch as much as possible around a stronger tree, back to the first tree and so on until the multiple strength of the stretched rubber is so great that the weaker tree gives way—Val Brown, Port Monmouth, N.J.
Nic Sprank
A PENCIL CAN LOCK A CAR.—A pencil mark drawn on each spark plug from the connecting post on top over the porcelain to the base will stop the motor from firing. Electricity will follow the pencil mark.—Paul Rhendy, Benwood, W. V.
BUTTER CAN BE HALF WATER.—By manipulation of the butter and the temperature of water used in washing out the buttermilk, butter can be turned out with 20 to 50 per cent water. The law requires less than 16 per cent.—Samuel LeBra, Lynn Haven, Fla.

These oddities of science, dealing with things we see or use almost every day, bring to our attention the fact that "all things are not what they seem." Nic Sprank needs more good Oddities—and will pay ONE DOLLAR for each one sent in which he uses. Try your luck! Send in yours, but be sure it hasn't been written up before in this or other publications. Include source of item, and proof if needed. Address Nic Sprank, Modern Mechanix, 529 So. 7th St., Minneapolis.

Power Transmitted by Radio to Run Railway Motor Car



Right: Transmitting apparatus from which attempt is being made to send power by radio to rail car. Wires at upper left lead to aerial. Above: Artist's sketch of first test, with rail car getting power from radio transmitter.

ELECTRIC locomotives will take their power from the air instead of from trolley wires or a third rail, if tests now being conducted by the Santa Fe railway prove successful.

A special transmitting station designed by M. E. Gregory of Brentwood, California, for sending power through the air has been set up along the railroad tracks at Boise City, Oklahoma. An attempt is being made to run a railway motor car 42 miles to Clayton, New Mexico, entirely by radio power.

A small track motor car is being used in the first tests.

Mystery Engine Amazes Science

A WORKING model of a true heat engine, in which heat is converted directly into mechanical motion, is amazing scientists. George Falconer of Fremont, Nebraska, inventor of this radical engine, made the model from a discarded air compressor and other scrap parts.

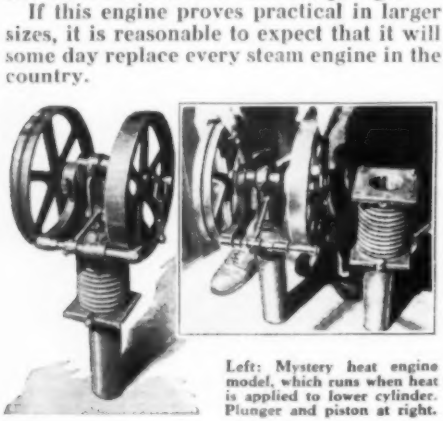
There are no valves, liquids, or burning gases. When heat is applied to the outside of the cylinder, the motor runs.

A plunger and piston move up and down in the single cylinder. The plunger, fitting loosely in the lower part of the cylinder, is timed to reach the top of its stroke about 10 degrees before the piston.

Although the theory of operation is not as yet clearly understood, it is believed that expansion of heated air and contraction of cooled air furnishes the power. The engine will not run when a petcock in the cylinder wall is opened.

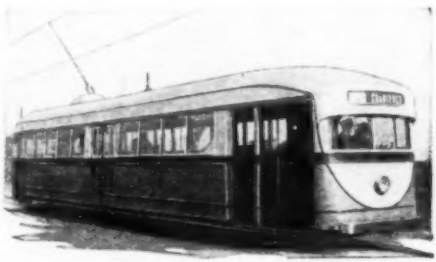
When running, the engine is silent except for the whir of flywheels and clicking of the lever arms which time the plunger.

If this engine proves practical in larger sizes, it is reasonable to expect that it will some day replace every steam engine in the country.



Left: Mystery heat engine model, which runs when heat is applied to lower cylinder. Plunger and piston at right.

Streamlined Streetcar Is Faster



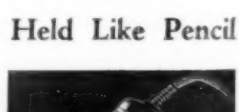
New, radically different streamlined streetcar now being tested by Chicago street railway company. Low steps and automatic rear doors are some of the outstanding features.

CHICAGO street railway companies are now testing a new streamlined streetcar of radically different design. In a trial run near the World's Fair grounds the new car showed greater speed, less vibration, practically noiseless operation, and greatly increased comfort.

The rear doors open automatically when passengers step upon the platform. Lower steps make entrance and exit easy.

Electric Eraser Held Like Pencil

AN electric erasing machine now available for draftsmen is held like a pencil. The erasing tip revolves at high speed, cleanly removing pen or pencil lines from intricate drawings without tearing the sheet. Different erasers are available for ink, pencil, or typewritten copy.



Electrically powered eraser operating on either a.c. or d.c. fits comfortably in hand, removes ink or pencil lines.

Scorns Whip or Gun to Tame Jungle Killers

Unarmed, but wholly at his ease, Captain Roman Proske poses with his savage pets, only a few weeks removed from their native jungles. Note his costume, scant protection against attack by one of the beasts.

CAPTAIN Roman Proske was dancing an awkward tango with Majana. But whatever the exhibition may have lacked in grace, it more than made up in daring. For the Captain's awkward partner was a three-year-old Bengal tiger who had not left the jungle until she was eighteen months old.

As the dance ended, Majana's paw suddenly flicked out. Steel claws sank deep into the Captain's upper lip. A wave of fear rippled through the audience. Men tensed and looked anxiously about for rescuing attendants, knowing that the smell of blood had the power to transform the tractable beasts into savage killers.

Captain Proske, however, was unmoved. Ignoring the blood which was now streaming down his white tunic, he approached Ramigana, biggest tiger of the troupe. The Captain seized the tiger's head, pried open his mouth, and thrust his dripping face into the beast's sharp-fanged jaws.

Painfully silent, the spectators waited. Still nothing happened. But the Captain was not yet through demonstrating his uncanny power over his savage pets. Coolly he formed a mattress of four of the huge cats, threw himself across their bodies and called to Sahib, who trotted over, straddled the trainer's body and helped himself to a piece of meat concealed in Proske's hand.

So complete is Proske's mastery over his charges that he places his head between a tiger's jaws without fear.

The incident is typical of the way Captain Proske works. Scorning the weapons common to a number of animal trainers, the Captain uses no guns, whips, chairs or goads to put his savage troupe through their paces. Instead, Proske relies upon kindness and humane treatment to achieve his effects, a method which has won him more than a score of medals and diplomas from European governments. How does he tame these jungle killers and bend them to his will? The Captain's explanation is simple.

"Suppose," he begins, "I should shoot a

(Continued on page 122)

New Photocell Eyes Protect Baby Cribs From Kidnapers

Mattress removed from baby crib to show photo-electric cell and equipment installed to protect infants from kidnapers. Light beam from "black light" lamp at foot is focused on "electric eye" at top. Relay closes to sound buzzer when beam is interrupted by reaching into the crib.

ANOTHER use has been found for that mysterious power known as electricity, and this time it will find favor with all mothers. The photo-electric cell, popularly known as the "eye which never sleeps," has been mounted on baby's crib. It watches throughout the night, ringing an alarm the instant anyone tries to reach into the crib.

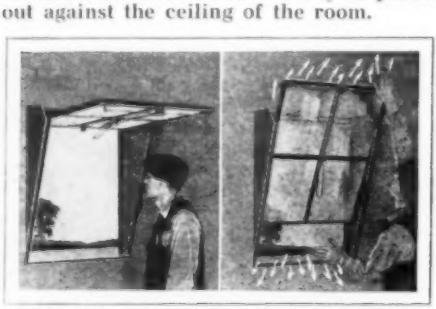
A light source concealed in drapery at the foot of the crib is focused on the electric eye mounted near the head. All visible light rays are filtered out with color screens, but the eye responds to the "black light" remaining. It is impossible to remove baby from the crib without crossing the protecting beam of light. The watchful cell responds instantly, closing a relay which sets off alarm bells.

Steel Windows Tilt in Frame

STEEL window frames now being manufactured especially for farm buildings do not swell or stick in damp weather, or dry out and rattle in dry seasons.

Wings at each side of the frame, into which the window may be tilted, provide indirect overhead ventilation with no drafts.

The hinging and sliding arrangement is such that the entire window may be pulled out against the ceiling of the room.



New steel frame window may be adjusted to many positions. At left window is swung against ceiling, providing full clearance. Right: window is set for indirect ventilation.

Radio Scale Speaks to Customer

WHEN you step up on the platform of the newest in talking scales, be prepared to hear a few words of shopping advice.

An electric phonograph unit is connected to the loudspeaker mounted above the scale. As many as 75 messages can be put on one record, so there is no danger that the voice of the scale will become monotonous to steady customers.

The scale indicates weight in the usual manner, rather than shouting it out and embarrassing some customers.

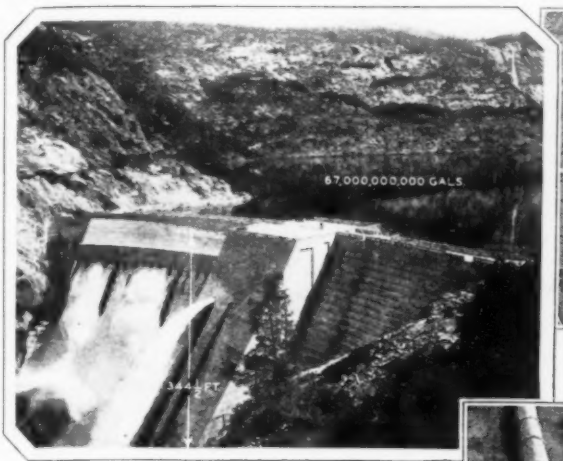
This scale doesn't shout your weight for all world to hear, but gives short shopping suggestions when coin is dropped.

Aviators Locate Sheba's Capital

THE French aviators Molinier and Malraux report that they have located and photographed the remains of the lost capital of the Queen of Sheba. They found towers and temples still standing on the River Tigris in northeast Syria, and brought back many photographs of the crumbling city.

This land was, in Biblical days, one of the wealthiest in the world. Great treasures may still be buried in the ruins.

Longest Tunnel Blasted In Solid Granite



Beautiful O'Shaughnessy Dam holds back waters of Hetch Hetchy reservoir, high up in Sierras. Tunnels and stairways inside dam permit inspection of interior at any time.

Blasting scene in 25-mile Coast Range tunnel, longest in world. Greater part of tunnel was cut through solid granite. Water flows through bare rock in many places.

9½-ft. diameter riveted steel pipe takes $11,500,000 Mountain Division tunnel across South Fork of Tuolumne River.

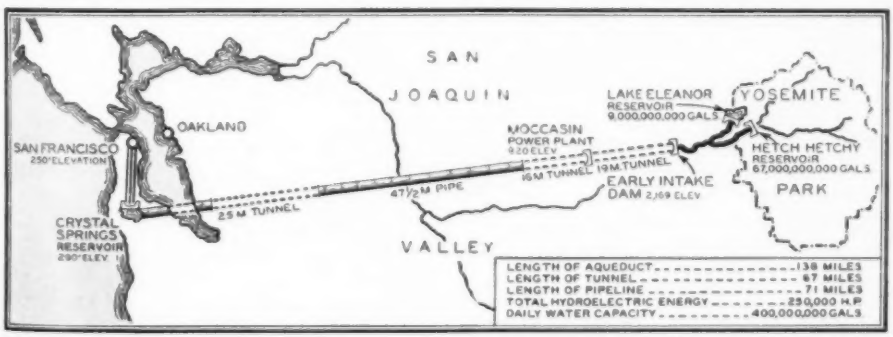
THE melting snows of California's Sierra Nevada mountains will this June dash downward 2000 feet through 138 miles of pipe line and tunnel into the water supply system of San Francisco.

Passing through 71 miles of riveted steel pipe 5 feet in diameter and through a total of 67 miles of tunnel cut out of solid rock, the clear cold waters of the Hetch Hetchy watershed will satisfy the needs of two million people living around San Francisco Bay.

The 25 mile Coast Range tunnel, the longest ever attempted by man, is just one of the many outstanding engineering achievements which M. M. O'Shaughnessy, San Francisco's city engineer, has supervised in the 20 years during which the aqueduct has been under construction.

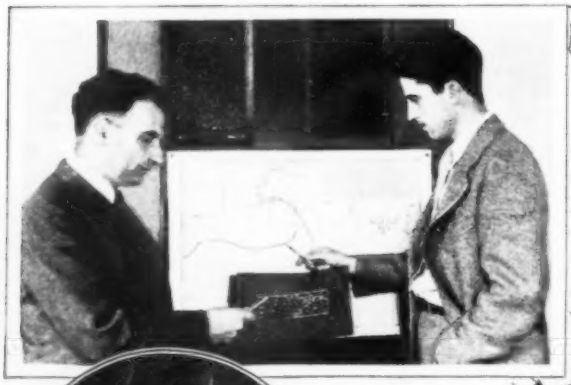
The power plants will convert a part of the energy of the falling waters into electrical power which is transmitted at 120,000 volts to San Francisco.

A series of reservoirs, beginning with the Hetch Hetchy on the main Tuolumne River and Lake Eleanor on one of its tributaries will store spring flood waters.



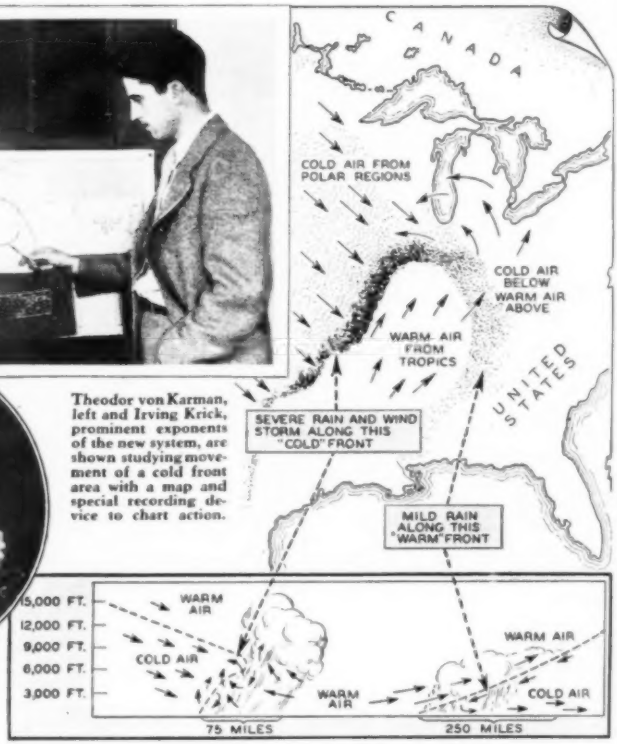
Map of Hetch Hetchy water supply project, nearing completion after 20 years of work. Waters from Eleanor and Hetch Hetchy watersheds enter 138-mile aqueduct at Early Intake Diversion Dam. First water will pass through this June.

Science Weighs Air to Forecast Weather



Theodor von Karman, left and Irving Krick, prominent exponents of the new system, are shown studying movement of a cold front area with a map and special recording device to chart action.

To aid in checking conditions, airplane pilots report temperatures every thousand feet after taking off on scheduled runs of any great length.



Eight types of air masses flowing over the United States create our various kinds of weather. The drawing above illustrates how cold air, moving down from the polar regions, meets the warm air of the tropics, with consequent disturbances. Newly developed instruments weigh and analyze these movements and enable scientists to predict weather in advance with surprisingly accurate results.

HIGHLY sensitized instruments capable of weighing and analyzing the air masses which flow over the United States are enabling scientists to eliminate all guesswork from the business of weather predicting. In fact, so accurate is the new system that in a single cold spell in the west the boundaries of the affected area were fixed in advance, resulting in a saving of $14,000,000 to California orchardists.

Equipped with devices which record the pressure, humidity and temperature of the upper air, scientists have discovered that our weather depends upon the action of eight types of air flowing across the United States. These "air masses," as they are called, create "cold fronts" and "warm fronts" as they come together.

In the latter, the warm air overlies the cold air. When they meet there is a mild disturbance. But in the cold front, conditions are reversed. The upper layer of cold air, being heavier, tends to sink, forces the warm air upward and brings about a condition resulting in severe rain and wind storms.

In general, the cold air flows down from the regions of the North Pole, while the warm air comes up from the tropics. With the newly developed instruments scientists are able to chart their courses in advance, tell where and when they will meet and the kind of weather that will inevitably result.

Although a Norwegian scientist worked out this theory several years ago, the system has recently been perfected by workers at the Massachusetts and California Institutes of Technology. In fact, Irving Krick and Professor Theodor von Karman, of California, predicted the storm that drove the navy dirigible, Akron, to its doom.

The national Weather Bureau expects to spend $350,000 to place the system in operation, to create a giant weather forecasting service for the entire northern hemisphere.

Canada Experiments With New Streamlined Locomotives

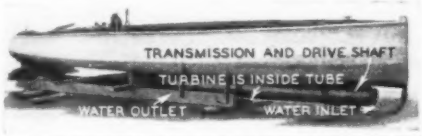
IN STEAM locomotives of the usual design, smoke is blown back from the smokestack to the engineer's cab unless the stack is unusually high.

In a new locomotive model recently developed in the laboratories of the National Research Council of Canada, well- known principles of streamlining are used to blow the smoke upward, where it will not interfere with vision. The smokestack is only a stub, but wind tunnel tests have indicated it to be far more efficient than the tall, gangling funnels so common on older Canadian engines.

By streamlining the entire engine and cutting off the smokestack, it is calculated that wind resistance is reduced by 35 per cent.

Model of proposed Canadian National Railway locomotive. Streamlining cuts down wind resistance and lifts smoke clear of engineer's cab. Note absence of usual tall smokestack. Wind resistance is 35% less.

Speedboat Uses Suction Drive



Water is sucked through a tube by a turbine screw to power this boat. A gear drive connects turbine and motor.

TURBINE vanes built into a tube beneath the hull literally pull a new French speedboat through the water. Official tests showed unusual speed and fuel economy.

The engine is mounted in the center of the boat in the usual manner. A transmission and driveshaft connect it with the turbine propeller below.

Bottle Radio Is Beverage Ad

NOVEL are the uses to which radio has been put. Here is one that deserves a place near the top of the list of clever tie-ups. A large beverage manufacturer approached the maker of a well known low priced radio set, and got him to adapt a set to a case that looks like the bottle the advertiser's beverage comes in. The result was a dummy case which resembled a large bottle of the well-known drink, with the added novelty of containing a radio set.

As means of advertising beverage, a radio was put in bottle.

Projector Gives Depth to Image

FORMERLY limited to flat pictures possessing only two dimensions, height and width, optical scientists have succeeded in adding depth to images thrown by projection machines. The result is a highly magnified picture which is amazingly life-like.

The new machines, technically known as "episcopes" and "catascopes," permit study of details which were lost in the old two-dimension pictures. In an experiment with a human hand, each tiny wrinkle, pore and blood vessel stood out with startling clearness. Highly colored objects, such as flowers, lose none of their original coloring.

Life-like images in three dimensions are possible with this new projecting machine. Notice how clearly details are visible in the giant hand shown in the picture above.

Indianapolis Speedway Rules

Many of these cars, starting out on the long grind at Indianapolis, will crash or drop out before the race is finished. Their failures are studied by auto engineers.

by JOHN C. HOFFMAN

THEY'RE off with an incredible roar. The sleek, multi-colored cars hurtle through space, past the judge's stand and around the first turn. The 500 mile Indianapolis speed classic is on.

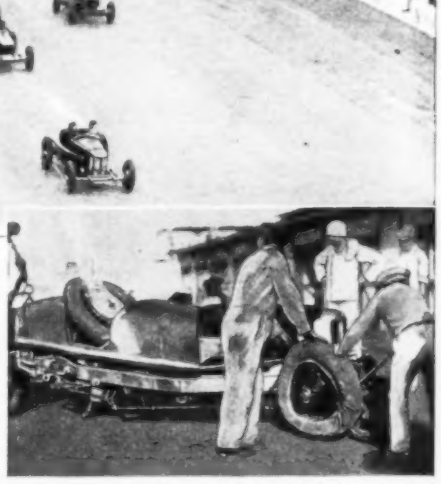
For five hours—or less—death rides with the daredevils who guide the whirling cars around the oval brick track, but in the end engines have learned another lesson in improving your automobile, the car you drive to the office.

That is the real value of the 500 mile auto race. Thrills, danger, crashes and speed attract the thousands of spectators, but the automobile industry tolerates death's annual toll only in the interests of better cars.

Back of it all is the crucial test to which each car is put 500 trying miles against time. This year more than ever the ingenuity of automotive engineers will be tried.

In an effort to combine maximum safety and mechanical development, the rules committee has drawn up a new set of restrictions to govern this year's race. Among other things, these restrictions are intended to develop the Diesel engine as a racing motor car and to encourage the eventual use of the Diesel power plant in commercial stock automobiles. The Diesels will meet their first tests in the qualifying trials.

When the cars speed around the track on Decoration Day, they will be allowed to use only 45 gallons of gasoline and 6½ gallons of lubricating oil. This means that the cars will have to average eleven miles per gallon of gas for the 500 miles. More drastic streamlining will be a direct result of this new restriction.



Billy Arnold stepped out of this flaming wreckage in the 1931 race and calmly lit a cigarette. His racing career ended in another crack up the following year.

Not more than four valves for each cylinder may be used. On four cycle engines, superchargers are prohibited, but are permitted on two cycle types.

Each car must be equipped with a braking system with two controls. On four cycle engines not more than one carburetor for every two cylinders may be used. There is no restriction on two cycle motors. Piston displacement is limited to 366 cubic inches.

True, some of the more daring race drivers are not as interested in mechanical developments as they are in the fame and fortune that go to the winner. They drive for the thrill of it and to win the crowd's applause. But back of the entire spectacle is the crucial test of 500 trying miles against time.

Develop DIESEL RACERS

New restrictions in greatest annual race classic are developing new engines and providing public with better cars. In the past speed has been paramount, but this year economy of fuel will decide winner.

In the history of the Indianapolis speedway races can be seen the great strides which the automobile industry has made. Every restriction has been met with faster motors operating on a more economical basis.

The Speedway race was inaugurated in 1911. At that time it was considered expedient, for the sake of speed, to limit the motors to 600 cubic inches of piston displacement. The result was that the cars, blunderbuses though they were, did an average of little more than 70 miles an hour.

Seek to Reduce Speed

Harroun, driving a Marmon, won the race at 74.59 miles per hour. In 1912 when Dawson, driving a National, reached the unbelievable speed of 78.70 miles per hour, the rules committee was startled.

To cut down the speed and save human lives the piston displacement was cut to 450 cubic inches in 1913. But the rules committee had not reckoned with shrewd mechanics. Goux, a Frenchman, won the race by averaging 76.92 m.p.h. New innovations were brought out in 1914 and Thomas won, averaging 82.47 m.p.h.

Improved Motors Break Records

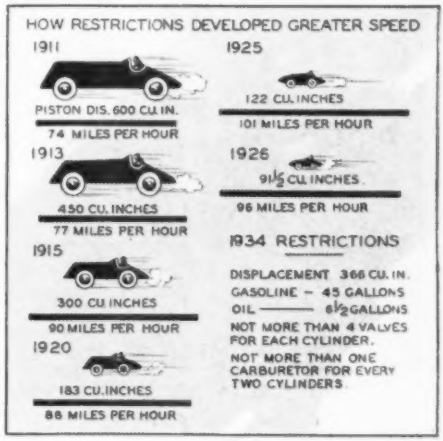
Again, the rules committee grew fearful of human life and reduced the displacement to 300 cu. in. Again the engineers met the challenge and that year, 1915, Ralph De Palma hurtled to victory at an average of 89.84 m.p.h.

De Palma's answer to the new restriction was a car that contained an engine with a shorter piston stroke.

When "Howdy" Wilcox averaged 88.06 m.p.h. in 1919 after no races in the two previous years, the rules committee drastically cut the displacement to 183 cubic inches. Speed did not suffer. Shrewd minded mechanics proceeded to add carburetors until by 1920 they had one for every cylinder and Lou Chevrolet won the race with an average of 88.50 m.p.h.

The displacement then was slashed to 122, but the boys had

(Continued on page 125)

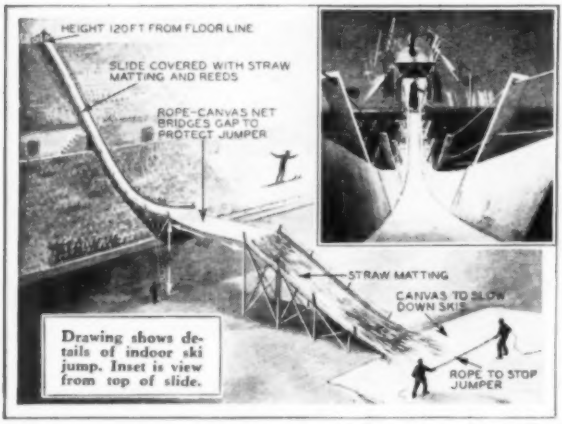


How engineers met the challenge of restrictions with greater speed is graphically illustrated above. This year's rules will probably see the development of the two-cycle motor and the Diesel engine in racing cars. Racers will have to average eleven miles per gallon of gasoline.

Lou Meyer is one of two drivers to win the race twice. His speed of 104.162 m.p.h. set new record in 1933.

Spills like this develop better frames, wheels and other improvements for your automobile. In this accident on a dirt track Billy Linn, the driver of the ill-fated car, got up slightly injured and waved to the crowds.

SKI *on* STRAW *in First* INDOOR *Meet*


HEIGHT 120 FT FROM FLOOR LINE
SLIDE COVERED WITH STRAW MATTING AND REEDS
ROPE-CANVAS NET BRIDGES GAP TO PROTECT JUMPER
STRAW MATTING
CANVAS TO SLOW DOWN SKIS
ROPE TO STOP JUMPER
Drawing shows details of indoor ski jump. Inset is view from top of slide.

STRAW replaced snow in the first indoor ski jump ever attempted in this country. The ski meet was held during the Northwest Sportsmen's Show in the Auditorium in Minneapolis, Minnesota.

Novel methods were used to protect the ski jumpers from injuries. The ski slide was built over the balcony in the large exposition building. The top of the slide was 120 feet high, while the jump takeoff was 35 feet above the floor. The full length of the slide was covered with straw matting over which reeds were placed.

In jumping the skiers bridged a gap of 40 feet, but the length of the jumps averaged between 75 and 90 feet. The skiers landed on an inclined runway, also covered with straw, that sloped to the floor. The end of the runway was covered with canvas to slow down the skis. Two men holding a rope between them stopped the ski jumper.

Both the slide and runway were protected by guard rails and sloping sides. Ropes were stretched across the gap from the slide to the runway. These were covered with canvas to prevent the jumper from falling to the cement floor if he stumbled. Anders Haugen, International ski champion eight times, was one of the stars.

Windows Tilt in for Cleaning

A WINDOW sash which permits both upper and lower windows to be tilted in for cleaning is finding favor with builders of modern homes.

With this arrangement, no ladders are needed when washing the outside of the window panes.

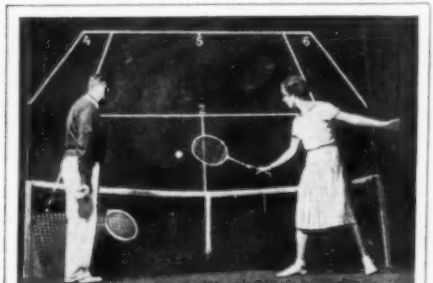
Windows of new type sash fold inward for easy cleaning.

Brushing Tonsils Recommended

SPECIAL tonsil brushes to dislodge germ infections are being recommended by Dr. D. Findlay, of London. Hairs softer than the bristles in toothbrushes are used. He suggests daily brushing of the tonsils.

Tennis Taught in Half-size Court

A GERMAN tennis instructor has invented an imaginary tennis court, in which one-half of the court is painted on the wall just behind the net. Balls are hit to areas of the screen resembling a regular court. The loft and angle of the ball shows which section of a regular court would be hit.

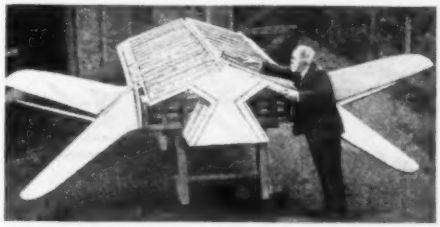


Tennis net is tacked to wall on this half-size tennis court. Court areas are painted on wall in the proper perspective.

Insects Furnish Design for This English Aerial Motor Car

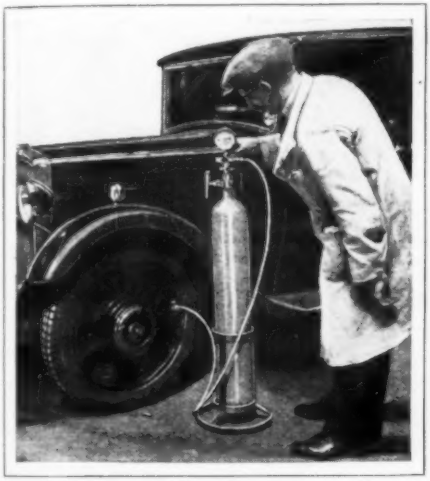
A WINGLESS airplane patterned after the dragon fly, which relies on two converging streams of air for its lifting force, is now being tested by T. A. Dring, 78 year old English inventor.

After studying the hovering flights of insects for 25 years, Dring built his first aerial car. The fuselage has a top surface resembling the gable roof of a house. Rotor blades driven by separate engines cause cone-shaped streams of air to converge under the flat fuselage, providing lifting force for the unusual ship.



This queer aerial car, patterned after the common dragon fly, has no wings but employs twin rotors. T. A. Dring, the inventor of the novel plane, points to gable-shaped fuselage.

Tires Are Inflated With Nitrogen



An English motorist is shown filling a tire from a nitrogen tank. This new element has a less harmful effect upon rubber than air and is expected to reduce danger of blowouts.

BY substituting nitrogen for air, English motorists expect to solve their tire troubles. The nitrogen is dry and practically free from oxygen which, present in air, has a harmful effect on rubber. In hot weather, the expansion of nitrogen is about half that of air, reducing the possibility of blowouts.

The nitrogen is supplied in steel cylinders under pressure up to 1800 pounds per square inch. Each cylinder will fill as many as forty tires at trifling expense.

Operation Restores Oldest Mummy

STRANGEST patient ever known to surgical science, Ra-Nofer, 5000-year-old mummy, recently underwent a successful operation. More than thirty fractures were mended after strengthening the bones in a resin bath.

Home Device Records Utah Quakes

INTENT on probing the mysteries of the upheavals and shifts constantly recurring below the earth's surface, a Los Angeles automotive engineer and amateur earthquake student has perfected a home-made machine which registers the earth's vibrations. Recently the inventor was successful in recording disturbances in Utah and Idaho.

Distant vibrations are picked up by an iron piling in the ground and transmitted to a needle which inscribes them on a glass disk. One part of the seismograph records the north and south vibrations, while duplicate apparatus records the east and west movements on another part of the same disk. This disk is covered with a lampblack solution in which the needle leaves its record.

IRON POST BURIED 6 FT. IN GROUND QUIVERS WITH EARTH TREMORS
SUSPENDED STEEL WEIGHT ACCENTUATES VIBRATIONS
WIRE ARM TRANSMITS VIBRATIONS
NEEDLE RECORDS THEM ON GLASS DISC
NORTH AND SOUTH VIBRATIONS
EAST AND WEST VIBRATIONS

Above, George D. Stuart, Los Angeles automotive engineer and earthquake student, exhibits the home-made machine with which he recorded recent tremors in Utah and Idaho. Distant vibrations are picked up by an iron piling in the ground, which, in turn, carries them to a needle operating on a glass disk. Right, a closeup of disk showing the quake vibrations.

Cabinet Stove Among New Home Comforts

SHARPEN KNIVES in a jiffy with this electric sharpener. Pressing the control button at the base starts the small electric motor which actuates the tiny sharpening wheels.

BED CHAIR cushion, with upholstered back and arms, is designed particularly for persons who like to read or eat in bed.

EGG COOKER whistles to the housewife when the eggs are ready.

CORK PULLER removes any size cork, big or little, in a moment. Prongs are slipped between cork and bottle, and the holder given a rocking motion and a twist to pull out tightest of corks. Prongs are protected in metal case when they are not being used.

CABINET STOVE combining gas range, kitchen cabinet, and table into one compact unit is ideal for small apartments. Central part of unit is four burner gas stove. Oven is below. Small shelves at each side of burners allow room for preparing foods. Cabinets underneath tables have room for broiler pan, coffee pot, and all other kitchen utensils.

Animated Statue Smiles and Displays Her Dimples

ALMOST human is "SHE," work of Courtenay Pollock, well known sculptor of London. With the aid of a small electric motor, "SHE" is smiling, coy, demure, or scornful as her master wills. Rolling her eyes about in an enchanting manner, she even displays a lovely set of dimples.

This "living" model is on display in one of the leading department stores of London. A cordon of police are required to keep the crowd moving and traffic clear in the streets.

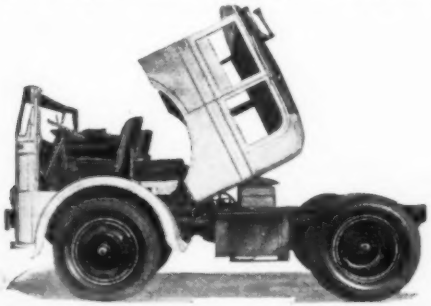
The skull is made up of hinged sections, each of which are controlled separately through levers and switches. Gears and levers connect each part to the driving motor.

When a tinted rubber covering is slipped over the "skull," eyebrows and hair attached, and a bit of cosmetics applied, "SHE" is transformed into a beautiful, vivacious young lady.

This first animated statue may herald a new era in sculpturing. It is not too much to expect that in a few years the works of our sculptors will all take on life—will frolic about and speak, imitating in every way the persons who posed as models.

"SHE", life-like creation of Courtenay Pollock, well known London sculptor, will smile, frown, wink, or display a lovely set of dimples at the command of her master. At right is view of skull without covering.

Cab Tips Back to Expose Engine



Cab of this tractor-truck tilts back for repairs to engine. Tiny but powerful Diesel engine is mounted on floor of cab between seats. Insulated hood covers the engine.

THE cab of a new Diesel-powered tractor can be tipped back out of the way when making repairs to the engine.

The Diesel engine used in this truck takes up so little space that it is located on the floor of the cab, between the seats. An airtight insulated hood keeps all heat and odors out of the cab, but is instantly removable for repairs.

Device Counts Radio Listeners

A RADIO-VOTING machine which counts the number of listeners on any radio program has been developed by Dr. Nevil Hopkins.

His radio-voting system can be used with any all-electric radio. When the announcer calls for a vote, listeners press a button. A totalizing machine at the power house converts the increased current consumption into votes.

Radio-voting machine to left of radio being operated by Dr. Nevil Hopkins, inventor. Current drawn by device when button is pressed is converted into votes at power station.

200 INCH TELESCOPE

Dipping the first ladle in the white hot furnace of molten glass for the 200-inch telescope mirror was an historic occasion in the history of astronomy. The "front" man in the photo above holds the face shield with his teeth.

by **WILLIAM JENNINGS**

COOLING slowly in a brick igloo in Corning, N. Y., is a lake of 34 tons of molten glass, representing the greatest scientific project ever attempted by man. It took six years to reach this stage of the great task and it will be more than four more years before its success is known.

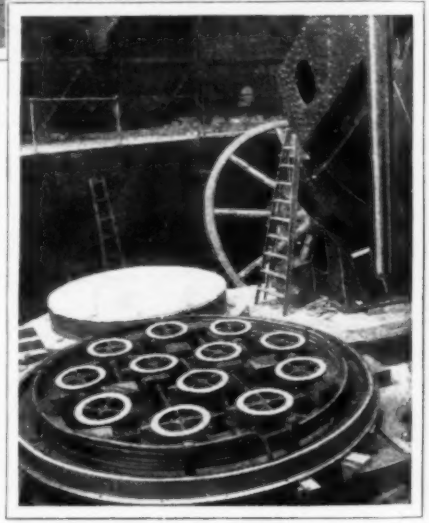
From far and wide scientists came to see the formation of this huge lake of glass—the pouring of the 200-inch telescope mirror that is expected to reach out into the unknown depths of the universe.

The work has hardly begun with the pouring of the mirror. Countless problems still face the scientists who have undertaken the task.

The most complex of these is the shaping of the mirror. To properly reflect and focus light from the stars the mirror of a telescope must have a concave surface that is exactly parabolic. Amateurs feel that they have accomplished much when a six inch mirror is polished and corrected to fractions of an inch after a few days' work.

The shaping, figuring, polishing, and silvering of the 200 inch mirror will require four years' time. When it is completed, it will have a concave paraboloid surface true to within two millionths of an inch.

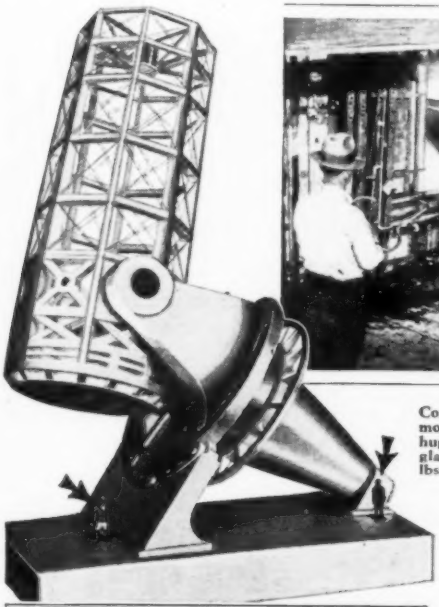
When the mirror is ready, engineers must find means to mount this great disk of glass that is 16 feet 8 inches in diameter and 26 inches thick.

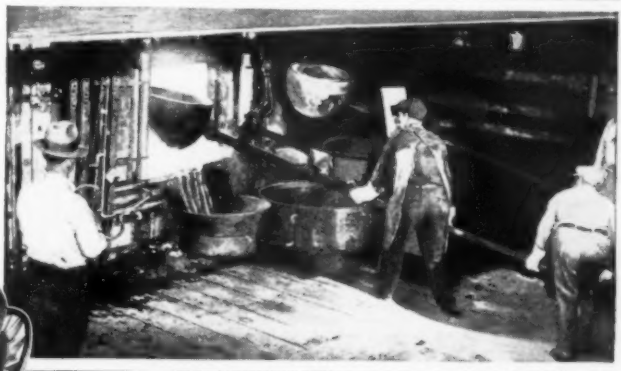


The type of mounting that may be used for the huge mirror is shown above. Circular pieces fit into holes in the back of mirror. The heating pipes keep the mirror at even temperature to prevent distortion of the image. The covered 100-inch mirror in background was put on this mounting.

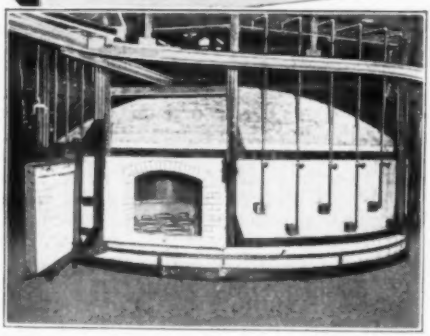
The telescope is of the reflecting type. That is, the light from stars is collected by a huge concave mirror, and focused on a smaller mirror which transmits the light to any eyepiece, where the astronomer or the camera sees the enlarged image. Usually the

Is Greatest Engine of Science





Comparative size of men to world's greatest telescope is shown in model at left. Workmen, grasping twenty-foot handle, dipped the huge ladle (above) into furnace and trundled 750 lbs. of liquid glass on an overhead monorail to the brick igloo. Only 400 lbs. were poured into mold, the balance cooling into solid glass.



This brick igloo covered the mold for the 200-inch mirror and was heated to 1000 degrees Centigrade before pouring began. Through the door can be seen the circular cores for forming indentations for mounting the mirror.

focal length of a mirror is eight times its diameter. The focal length determines the length of the telescope. A 200-inch mirror would require a telescope more than 130 feet long.

To overcome the engineering problem of mounting and swinging a tube of such great length, the focal length of the great mirror will be reduced to 55 feet, requiring a telescope only 60 feet long.

The popular conception that this great telescope may reveal cities and life on Mars does not interest astronomers. They believe they have proved quite conclusively that human life does not exist on Mars. The 100 inch mirror at Mount Wilson observatory determined that only one-tenth of one percent of oxygen exists in Mars' atmosphere, not enough to support life.

The purpose of the 200 inch telescope is to gather more light to show the faintest stars, planets and nebulae. The huge "eye" will reach farther into space. It will increase man's knowledge of the vast voids of the cosmos, in which countless universes whirl on to an unknown destiny. The instrument will be used chiefly for photographic, spectrographic and radiometric work, that will give astronomers a better picture of the minerals and gases existing countless light years away from the earth.

The gigantic telescope will cost $12,000,000 and will weigh 1,600 tons with its mounting. It will gather about 2,000,000 times more light than the human eye or about four times more than the present largest telescope, the 100-inch instrument of Mount Wilson Observatory.

A great difficulty that still remains to be solved is the transportation of the mirror to the site selected for the telescope. At first the plan was to ship the mirror from Corning, N. Y., to New York city by rail, from New York to Los Angeles, via the Panama Canal, by sea, and then by truck to Pasadena and to the site selected by Mount Wilson astronomers.

The plan had to be abandoned when it was discovered that the mirror will be too

(Continued on page 141)

Combination Dirigible-Plane to Be Safe, Fool-Proof Liner

John C. Smith displays his model of air-liner of future, a combination dirigible-airplane. Propellers in nose of gas bag and wings of plane below give high speeds.

LOS ANGELES auto mechanic, John C. Smith, claims to have invented a fool-proof and safe airplane.

Smith has built a model of his unusual flying ship. Helium gas in a torpedo-shaped bag supplies lifting power for the new air liner. Regular airplane wings and fuselage, with three aviation engines built into the wings and nose of the gas bag, give the craft speeds equal to those of modern airplanes.

The new ship is really a combination of airplane and dirigible. As yet no passenger-carrying models have been built.

New Airliner Record Is 221 M.P.H.

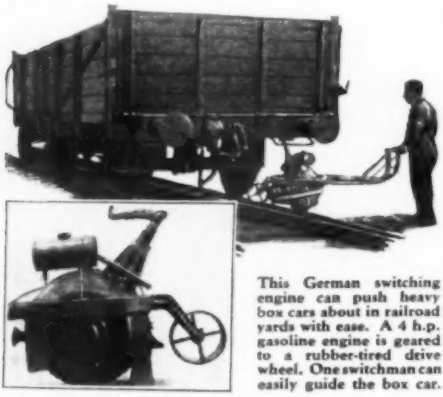
THE new Lockheed ten-passenger Electra monoplane has set a new world speed record for multi-motored air liners. In a test flight at Santa Ana, California, the ship was clocked at 221 m.p.h.

The high speed is attributed to streamlining, since the two engines are rated at but 420 horse power each.

Tiny Gas Engine Shunts Box Cars

GERMAN engineers have developed a midget engine for shunting freight cars about in railroad yards.

Just as a worker pushes a wagon with his shoulder, this tiny single wheel device pushes heavy box cars around with ease. A single worker can control the engine perfectly while walking alongside the moving car. A two-cycle gasoline engine developing 6 h.p. is geared to the large, rubber-tired wheel. A small metal wheel at the front serves to keep the engine in an upright position.



This German switching engine can push heavy box cars about in railroad yards with ease. A 4 h.p. gasoline engine is geared to a rubber-tired drive wheel. One switchman can easily guide the box car.

Jap Auto Is Traveling Postoffice

A postoffice on wheels is this Japanese auto. The postmaster of Kobe, Japan, sells stamps to sailors and travellers. Note use of motorcycle engine, with handlebars for steering.

A POSTOFFICE is always at hand when passengers arrive or embark from any ship at the Japanese seaport village of Kobe. An enterprising postmaster has set up offices in the rear of an odd automobile. He follows the crowds around the water front, selling postal supplies to sailors and travellers. The car is powered with a motorcycle engine.

Tamed Humming-birds Sip Honey

TRAINING humming-birds to sip honey from his lips is the unusual accomplishment of Ralph Ayer, a farmer living near Eastonville, Colorado. These tiny birds have heretofore been considered untamable.

Perfume bottles filled with honey and flowers first attracted the birds. They now return each year.

Ralph J. Ayer, Colorado farmer, has trained humming-birds to sip honey from small perfume bottle held in his mouth.

Turbo Wheel Liners to Speed Across Seas

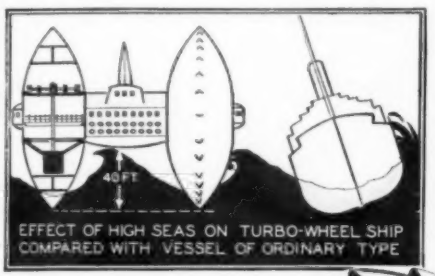
AVIATION'S rapid strides are revolutionizing all other modes of transportation. Railroads are meeting the demand for greater speed with streamlined trains. Automobiles are following the most modern trends in streamlining.

On the seas, however, even a streamlined ship will not be able to meet the competition of regular airplane schedules touching airports anchored in the ocean. Resistance from wind is great, but the sea itself slows down an ocean liner much more.

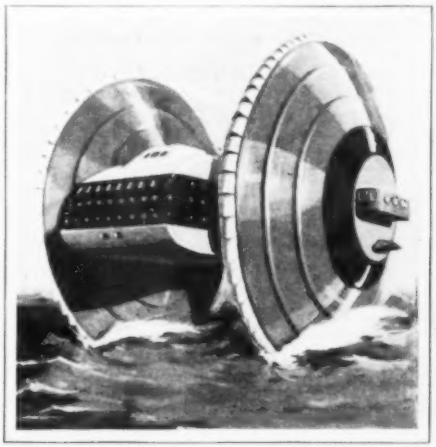
To overcome this an inventor has conceived the Turbo Wheel liner, which is expected to reach a speed of 100 miles an hour. At this speed the rapidly revolving wheels of the liner will lift the hull out of the water. The ship will ride on the outer rim of the wheels only.

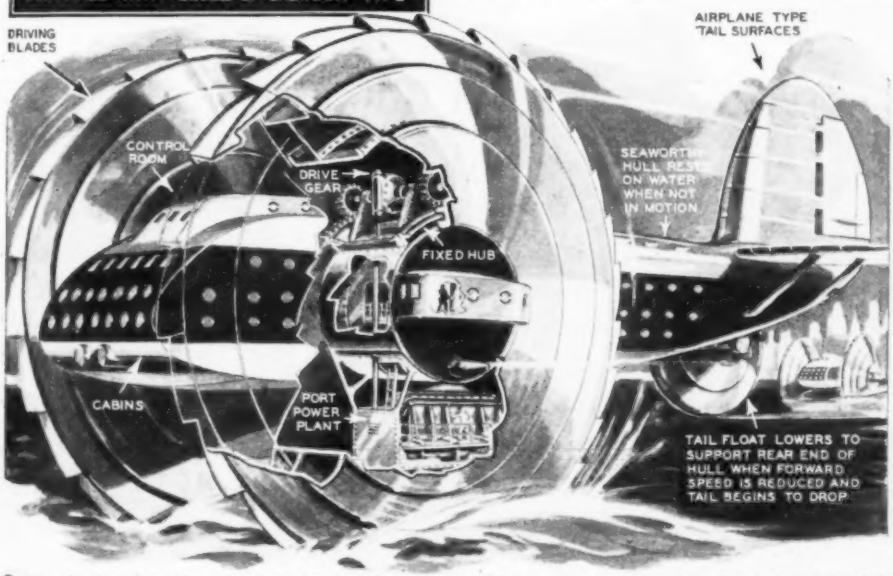
A lifting tail of airplane type holds the hull parallel to the line of travel. Normal airplane rudder and tail flaps control steering at high speeds.

At low speeds a revolving tail float is lowered to support the rear end of the hull and provide steering. Powerful Diesel type engines slung low within the rotor wheels drive each wheel independently through gearing. The Turbo Liners are expected to be capable of a speed of 100 miles per hour.



EFFECT OF HIGH SEAS ON TURBO-WHEEL SHIP COMPARED WITH VESSEL OF ORDINARY TYPE


This radical design for an ocean liner would revolutionize sea travel. The ship could travel 100 miles an hour.


DRIVING BLADES
AIRPLANE TYPE TAIL SURFACES
CONTROL ROOM
DRIVE GEAR
FIXED HUB
SEAWORTHY HULL RESTS ON WATER WHEN NOT IN MOTION
CABINS
PORT POWER PLANT
TAIL FLOAT LOWERS TO SUPPORT REAR END OF HULL WHEN FORWARD SPEED IS REDUCED AND TAIL BEGINS TO DROP

Cutaway drawing above shows location of power plant and gear drive to revolve wheels. Huge fluted wheels propel the liner at 100 miles per hour. At rest the huge cabin hull would float on the ocean as shown in the right background.

Brain Meter Tests Lawmakers' Intellect

Your Congressman's Brain

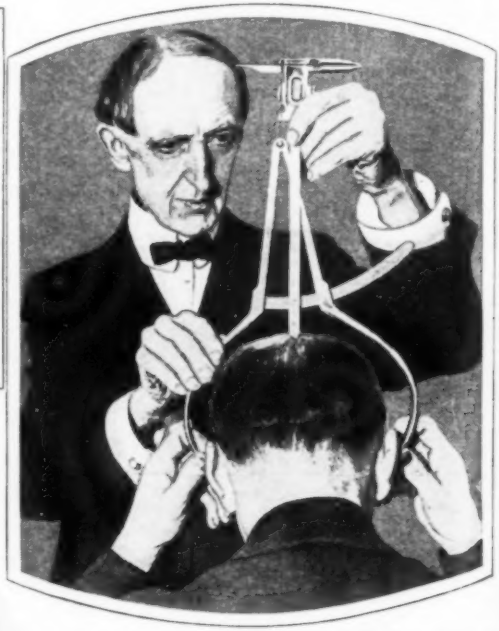
Based on partial survey of 89 senators and congressmen.

SENATORS' brain weights averaged 52 oz., congressmen, 50 oz. The greatest brain weight, 55 oz., was shown in members from Arkansas, Texas, Louisiana and Oklahoma.

The next highest brain weight, 53 oz., was found in members from Minnesota, Iowa, North Dakota, Nebraska and Kansas.

The lowest weight, 49 oz., was registered by members from California, Oregon and Washington.

A scientist attached to the Smithsonian Institute displays fossilized brain specimens. In his right hand is that of an average person; in his left, that of a superior mentality.



Dr. Arthur MacDonald, inventor of the brain meter, is shown with his new instrument, not unlike a pair of calipers, conducting one of his remarkable brain weight tests.

PIONEERING in a new field of medical science, Dr. Arthur MacDonald, a prominent scientist of Washington, D. C., has perfected a new machine which weighs the brain in a living person—hitherto an impossible feat.

Recently Dr. MacDonald made a partial survey of the brain weights and body measurements of our national lawmakers as the first step in an experiment expected to lead to a study of the mental and physical equipment of legislative bodies throughout the world. Eighteen senators and seventy-one congressmen showed an average brain weight of 52 and 50 ounces respectively. The greatest brain weight—55 ounces—was shown by members from Arkansas, Louisiana, Oklahoma and Texas, who likewise possessed the greatest stature—70 inches—and the greatest head length—8 inches.

Legislators from California, Washington and Oregon registered the lowest average brain weight—49 ounces—and the smallest head length; yet, oddly enough, showed the strongest hand clasp, with an average of 203 pounds. Conversely, members from Kentucky, Tennessee, Alabama and Mississippi, although possessed of the greatest average body weight, scored lowest in the hand grasp test with grips of from 80 to 91 pounds. Lawmakers from Minnesota, Iowa, North Dakota, Missouri, Kansas and Nebraska revealed brain weights of 53 ounces and an average stature barely below 70 inches.

Aside from the novelty of these tests, groundwork is being laid for insuring an increase in the length of life of our national leaders. Comparative studies of these men who come from various sections of the country likewise offer an opportunity for scientists to establish data on the general physical and mental status of the nation.

New Corner Mirrors Help Reduce Paris Traffic Accidents

DETERMINED to reduce traffic accidents at street intersections, French engineers have installed a novel device on the principal streets of Paris which has proven unusually successful.

Large convex mirrors placed on top of steel posts guard the corners. The nature of the mirrors is such that drivers preparing to make a turn are able to see from a distance the movements of all cars in side streets.

The new system has been approved by the traffic commission of Paris and has proved highly efficient in recent tests.

Paris street corners along the principal thoroughfares are guarded by these large convex mirrors which enable a motorist to see clearly cars coming from side streets. The new device has proven highly successful in recent tests.

Bird Selects Heated Home Site

Light housekeeping, humming bird style, atop an electric light bulb in Los Angeles.

UNDISTURBED by the din of downtown Los Angeles, a ruby-throated humming bird has built her nest atop an electric light bulb.

The nest is suspended about twenty feet above the ground near the city's busiest intersection. The nest has no top; but heat from the bulb supplies necessary warmth on chilly evenings.

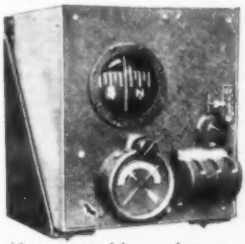
Ambergris Finds Worth Thousands

FORTUNE hunters swarmed over Bolinas Beach, Marin county, California, following discovery of thousands of dollars of ambergris. This curious substance, cast up by ailing whales is used as a perfume ingredient and in its pure state has been valued at from $26 to $28 an ounce.

Mrs. Louis Pepper and her daughters examine a valuable chunk of ambergris which they found on Bolinas Beach.

Device Flies Plane Minus Pilot

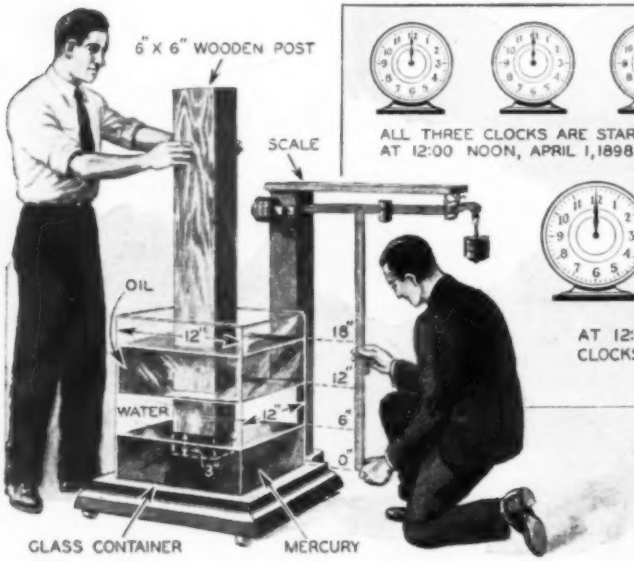
DESIGNED to fly an airplane without the aid of a human pilot, a device known as the "Aerobot" was recently tested at the Glendale airport. Installed by Art Goebel, famous flyer, the mechanical pilot successfully underwent various maneuvers.



Above, control box and compass which fly plane minus a pilot.

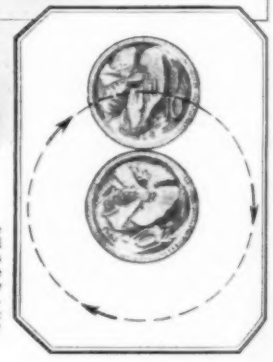
Built chiefly as an aid to commercial planes in blind flying, the device may also be operated by wireless with no human being in the cockpit. The robot is a box-like arrangement of endless chains and valves that hook onto the control stick and rudder of the plane. It takes only a cubic foot of space and is attached to the instrument board.

$25 Prizes for 3 Tricky Teasers



No. 1: Glass container weighing 87 lbs. is placed on scale. When wood post is 3" above bottom, fluids are at levels shown above. Weights of materials per cubic foot are: wood 31 lbs., water 62.4 lbs., mercury 846.6 lbs., and oil 59 lbs. What will scale read with wood held as above?

No. 2: Three clocks are started at same time. 24 hours later one is 7 min. slow, one 5 min. fast, one correct. What is first day when all 3 clocks will be correct again at noon?



No. 3: Two coins are same size. One is held steady while other is rolled around it once without slippage. How many times will moving coin rotate about its own center point?

HERE are three more teasers for those who enjoyed the last Problems Contest and asked for more.

Work these any way you please, with slide rule, adding machine, higher mathematics, or just plain grammar school arithmetic—you'll get the same answers by each method. All three are simple if you know how. Watch your step.

Write out or type your answers on one sheet of paper, and tell in a few words how you obtained them.

For the neatest and most accurate solutions to this set of problems, MODERN MECHANIX AND INVENTIONS offers $25 in prizes, as follows: First prize $10; second $5; and four third prizes of $2.50 each.

Contestants must give age, occupation, and education, though this information will not be considered in awarding prizes.

Your entry should be postmarked not later than May 25, 1934. Decisions of judges will be final, and no entries will be returned. In case of ties, duplicate prizes will be awarded.

Employees of this magazine or their relatives are not eligible to compete. You don't have to buy a copy or be a subscriber to enter. Address M-M Problems Contest, 529 So. 7th St., Minneapolis, Minn.

April Problems Contest Winners

THOUSANDS of entries flooding into our office, most of them correct, made judging of this contest extremely difficult.

Lewis W. Sloan, Fort Bragg, North Carolina, wins 1st prize of $10. He says:

There is the same amount of tea in the coffee as there is coffee in the tea. At the second transaction there must be one molecule of tea left for every molecule of coffee taken out of the coffee cup.

A sheet of paper 6/pi inches, or 1,909,859,317,102,744,029,226,605,160,470,172,344,413,512,565,615,6-inches thick will go under band. Pi was used to 52 places.

Since the trains meet in two hours, the bee flies 190 miles.

Second prize of $5 goes to Verner Nystrom, R.F.D. No. 2, Stoneboro, Pa. Four prizes of $2.50 each were won by Philip Claybourne, Albert Lea, Minn.; M. B. McKaig, United States Naval Academy, Annapolis, Md.; G. L. Rush, Kansas City, Mo.; and Joseph F. Frola, Braddock, Pa.

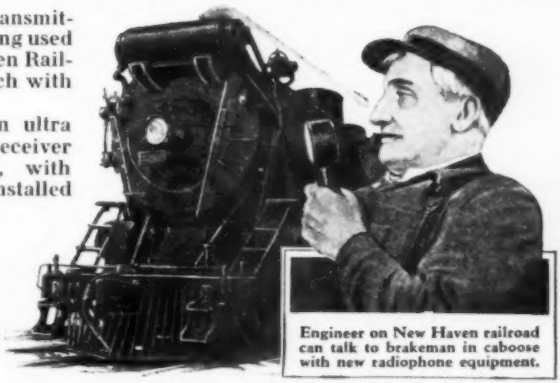
Train Crew Signals Engineer by New Short Wave Phone

EXPERIMENTAL five meter transmitters and receivers are now being used on a freight train of the New Haven Railroad to keep the engineer in touch with the brakeman.

The equipment consists of an ultra high frequency transmitter and receiver using newly developed tubes, with microphone and loudspeaker installed in both engine cab and caboose.

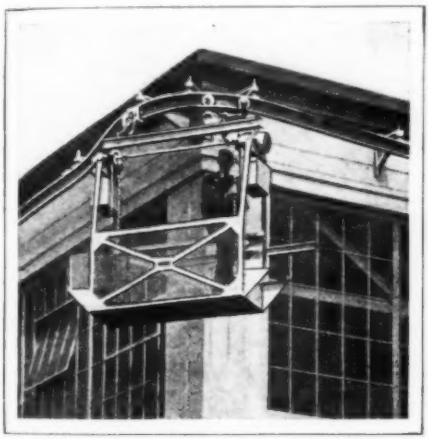
Separate antennas are used at each end of the system for sending and receiving. The entire equipment operates from a 6 volt storage battery supply, and is capable of 30 hours continuous operation without recharging.

Receivers operate continuously, while a convenient button on the hand microphone places the transmitter on the air in a moment.



Engineer on New Haven railroad can talk to brakeman in caboose with new radiophone equipment.

Rail Cars Aid Window Washers



Window washers are absolutely safe on this mono-rail car which can be maneuvered to reach any window in building.

MONO-RAIL cars are now being used on large buildings to provide absolute safety for window washers. Workers can reach any window in the building without leaving the car.

The mono-rail track extends all the way around the building near the roof. It is supported by angle brackets at a distance of two feet from the outer walls, and goes around the corners in sweeping curves.

Cars in which the window-washers work can be raised or lowered from floor to floor with an easy-working chain hoist. A hand-controlled chain drive is also used for moving the car from place to place along the mono-rail track.

Why Bullet-Size Meteors Are Seen

DR. ERNEST OPIK of Harvard University recently explained just why meteors or "shooting stars" no larger than a bullet can be seen 50 miles above the earth, when even our largest balloons would be invisible to the eye at this height.

Light coming from the white-hot solid particle has almost nothing to do with the bright streak in the sky. The heat given off by the particle ionizes the air atoms. We see a streak of luminous gas very similar to that in a neon sign tube.

Auto Operates Fire Fighting Pump

A SMALL but efficient water pump which can be mounted on the cylinder block of any auto and driven by the fan belt is inexpensive enough to be used for fire protection on farms, or for spraying.

With the auto engine running at a speed equivalent to 20 m.p.h. in high gear, the pump delivers 1000 gallons of water an hour at from 75 to 100 pounds pressure. Water can be drawn from lakes or from a tank carried on the truck.

A clutch arrangement permits the pump to be left on the car continually.

Tiny pressure pump which bolts to cylinder head of any car and operates from fan pulley will deliver powerful stream of water for use in fire fighting or spraying.

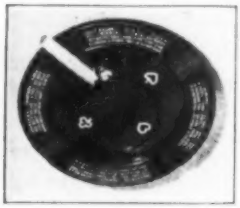
Extra Cylinders Easily Added to New Aviation Engine

J. M. McCullough (at right), designer, points out features of interchangeable cylinder aero engine to Pilot Purcell.

EXTRA cylinders may be added as desired to a new aviation engine being developed by Berkeley, California, engineers. Essentially the engine consists of four single cylinder units, to which more cylinders may be added in pairs to make sizes of four, six, two banks of four, two banks of six, two banks of eight, two banks of twelve, and four banks of eight cylinders. The power developed runs from 200 to 1600 h.p.

Cylinder units are geared to the propeller shaft. Propeller pitch is controllable through a wide range of plus or minus pitch from the pilot's seat.

Bakelite Ash Tray Has Three Uses

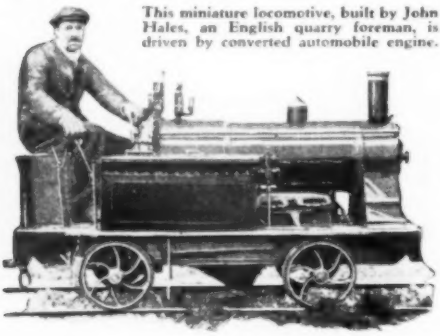


New ash tray has many uses.

A NEW molded ash tray has a snuffer to extinguish lighted cigarettes. It indicates also the scoring for contract bridge, and serves as a very handy coaster for beverage glasses.

Auto Engine Runs Tiny Locomotive

A SMALL locomotive made by an English quarry foreman in his spare time is constructed entirely from scrap parts such as a hot water boiler, kitchen utensils, and old bed frames. An old automobile engine supplies the motive power for the unusual engine. It can haul loads of up to six tons.



This miniature locomotive, built by John Hales, an English quarry foreman, is driven by converted automobile engine.

All Wheels Steer on This Truck

Above: Bottom view of truck model equipped with new all-wheel steering apparatus. Note that farthest rear wheels turn opposite to those in front. Driver wheels do not turn.

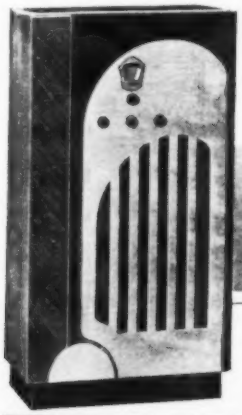
A NEW steering apparatus, which may be applied to busses and trucks having six or more wheels, eliminates side drag on the tires and permits turns of much shorter radius. All wheels except the two drivers are connected with the steering apparatus, each pair of wheels being turned just enough to relieve the side drag on tires.

Radio Buyers Dictate New Designs

DETERMINED to eliminate all guesswork, radio manufacturers recently conducted an intensive survey to determine exactly which cabinet designs and mechanical features most appealed to prospective radio buyers.

Trained investigators recorded thousands of preferences in cities large and small from coast to coast. Out of this mass of statistical data, radio engineers were able, for the first time, to tabulate the likes and dislikes of the American radio audience. The immediate result was a radical change in cabinet design, harmonizing with all styles and periods of furniture. In keeping with the outward refinements, engineers designed new tubes, perfected remote control devices, eliminated aerials, built new speakers and made short wave reception possible in every home.

Not a Duncan Phyfe antique, but a new Colonial-type radio.



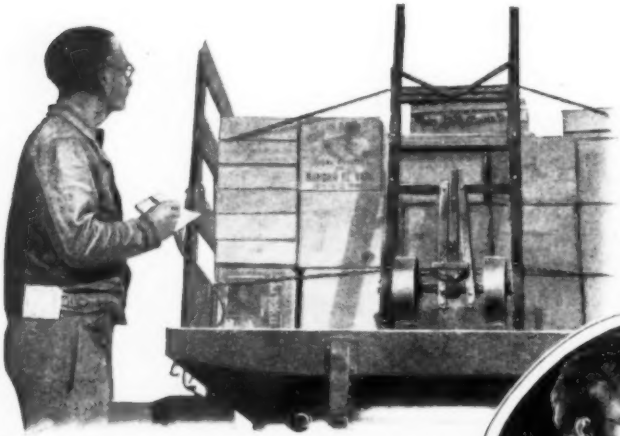
A distinct novelty is this dual-wave radio globe which may easily be carried from room to room.

Designed to supersede the bulky, outmoded cabinets of the past, this modernistic design is a striking answer to fans' demands for something new and different.

Economy of space is only one of the features of this modernistic radio-bookcase.

The lazy man's dream comes true in this model which permits the operator to regulate the volume or change stations without leaving his chair.

EVERYDAY FOODS *that*



Moving field laboratories follow the producing seasons, moving from one district to another with the pickers. An inspector is shown in photo above checking a produce truck for poison signs before granting it an official release.

WARNING

Don't buy food in cans that are bulged.

Don't judge meat solely by its bright red color. It may have been treated with sodium sulphite.

Wash and brush all vegetables thoroughly.

Eat no fruit peelings unless washed. Beware the stem and calyx ends.

Throw away all questionable food. It's better to ruin your budget than risk your life.

By digesting vegetable samples with boiling nitric acid, a chemist determines the poison content in the spray residue left on plant.

ARMED with beakers and test tubes, scientists are waging a grim struggle against one of America's most deadly enemies—the fatal poisons that lurk in common household foods.

The peril is not remote or imaginary—a scientific scare launched by some wild-eyed and overly enthusiastic laboratory worker. The danger is real—and no more distant than the corner grocery store. Such common foods as apples, pears, beans, spinach, even the lowly cabbage, carry microscopic elements which may mean death or disability to the consumer.

Recently fifty people became ill simultaneously after eating at a certain restaurant. A food inspector, hurriedly summoned, investigated the kitchen and found that cabbage being served contained a dangerous amount of arsenic.

Quickly the inspector traced the shipment back to its origin, a truck farm some distance from the city. Racing to the scene, he halted the harvesting of 11,000 heads of cabbage which had been sprayed with an anti-pest solution of arsenic a short time previously. But for the inspector's prompt action, 11,000 poison cabbages would have been distributed throughout the city within a few hours, carrying possible death into countless homes.

On another occasion the food detectives were called upon to inspect an apple shipment at a western orchard. A test of the solution with which the apples are washed to remove the spray residue proved that it

Oranges or other fruits and vegetables that have been sprayed or dusted with poisonous anti-pest solutions are given a thorough washing before being placed on the market.

Endanger Life

by MAXWELL REID GRANT

Poison death lurks in common table fruits and vegetables. Here is the story of how science battles to safeguard our foodstuffs.

Constantly on the alert to safeguard purchasers, federal inspectors frequent the wholesale produce markets, checking shipments in their ceaseless war against the menace of poison foods.

Modern science not only wars on poison foods but also sets up standards to protect the public against marketing of inferior products. Scientists, equipped with Sohlett jar and refractometer, are shown measuring avocados to see if they contain the fat content prescribed by law.

was too weak for safety. Some of the poison spray still clung to the fruit. A hasty check-up revealed that one load of the poison apples was already speeding toward market.

Warning messages hummed over the wires to agents in neighboring counties. Armed with descriptions of the missing truck, inspectors patrolled the highway, intercepted the deadly load and returned it to the ranch for reconditioning.

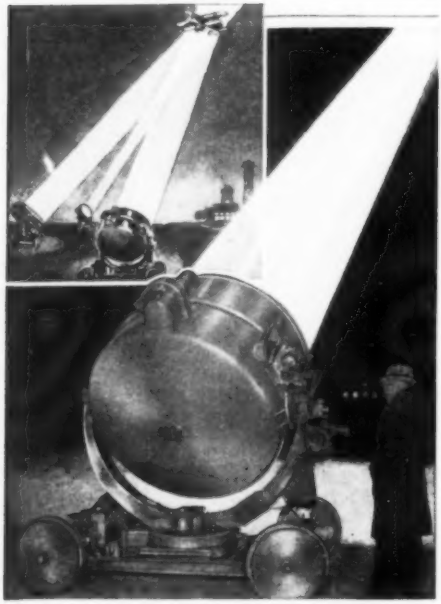
Last year more than sixty million pounds of arsenic preparations were used to fight pests on growing crops in the United States. Only ceaseless war against poison foods prevents the loss of many lives. To safeguard the consumer, moving field laboratories follow the producing seasons in California, moving from one area to another as pickers begin work. Each morning samples of the produce are chemically tested. If poison is found, shipments are promptly stopped. Often whole loads of beans, apples and pears are unloaded and mechanically scrubbed before the inspectors release them.

The arsenic-carrying foodstuffs are not always fatal to the consumer. Generally the actual poison content is small, resulting in illness from which the patient recovers. More to be feared are certain organisms found in spoiled food which has been canned—the deadly botulinus bacillus which brings death three times out of five.

War on the botulinus organism began with dramatic swiftness in 1919, following an epidemic of poisoning throughout the United States. Pickled ripe olives served at a banquet in Canton, Ohio, had taken a toll of seven lives. Investigation revealed living botulinus organisms in the brine in which the olives had been packed. The Canton deaths were followed by an alarming series of poisonings over the entire country—all traced to the same olive shipment.

Laboratory experiments were hastily launched to propagate the organism for study. Spores of the bacillus, harvested from young cultures, were weighed and counted. Crop production methods were studied, compulsory inspection inaugurated and the death epidemic was halted.

Giant Searchlights Automatically Focus on Air Raiders



Mounted on a trailer, the giant searchlight is quickly towed from one spot to another and operated by remote control. Note size of projector—60 inches in diameter.

GIANT searchlights which locate an approaching plane by sound and automatically flood it with light are Uncle Sam's newest weapons against possible air raiders. The apparatus consists of a motor truck with a power plant for the light, the projector, sound locator and corrector and the control station. The sound locator detects the plane's approach, the corrector calculates its position and the projector then automatically floods the ship with a beam of light measuring 800,000,000 candle power. Remote control permits scattering of the units, preventing complete destruction and affording safety for the crew.

Coal Saw Replaces Drills

OLD style drilling methods are outmoded by a "walking" coal saw with teeth several inches long mounted on a rapidly moving belt. Hydraulic pistons "walk" the machine forward.

Driving chain for saw teeth is patterned after caterpillar tread.

Ride Offers Thrills of Looping

Car swings forth and back until momentum carries it over the top.

ALL the thrills of a looping airplane are available in a new amusement device which recently made its appearance in Los Angeles.

A car resembling the cockpit of a plane is supported on a hollow steel tube which pivots on a large ball bearing mechanism at the top of its steel frame.

The device is powered by a small electric motor which swings the car back and forth, gradually increasing the arc until enough momentum is developed to carry it over the top.

Golf Machine Improves Driving

GOLFING faults may be cured with this driving machine which can be set up in any home. It uses a captive ball and requires no back stop. A dial indicates the length of the shot.

Photo illustrates compactness of driving machine. Insert shows dial which registers length of drive and plunger bringing ball into position.

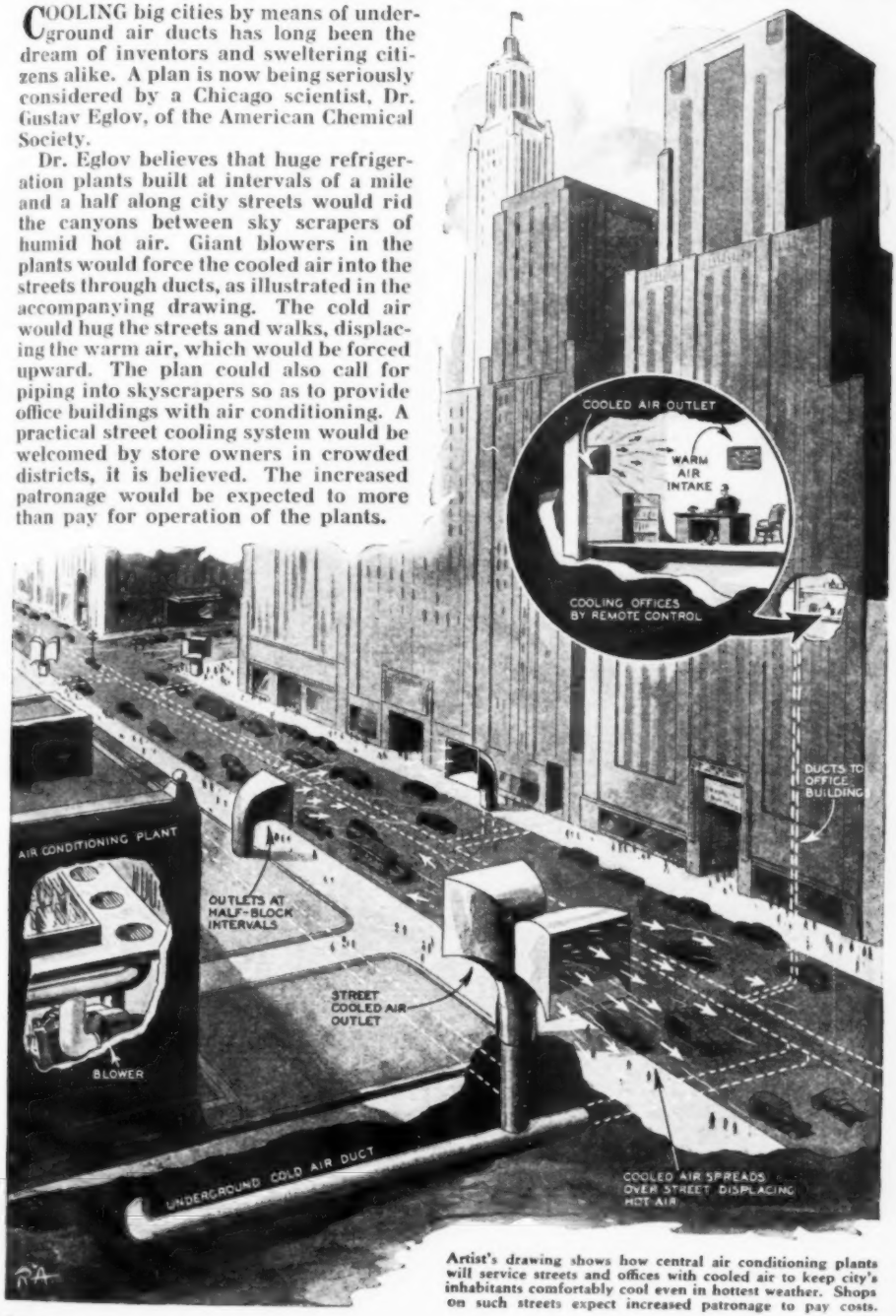
New Trousers Have Lasting Crease

PERMANENTLY creased trousers have been perfected in England by weaving each thread around a rubber core. The fabric preserves the press and avoids wrinkles.

Big Cities to Have COOLED Sidewalks

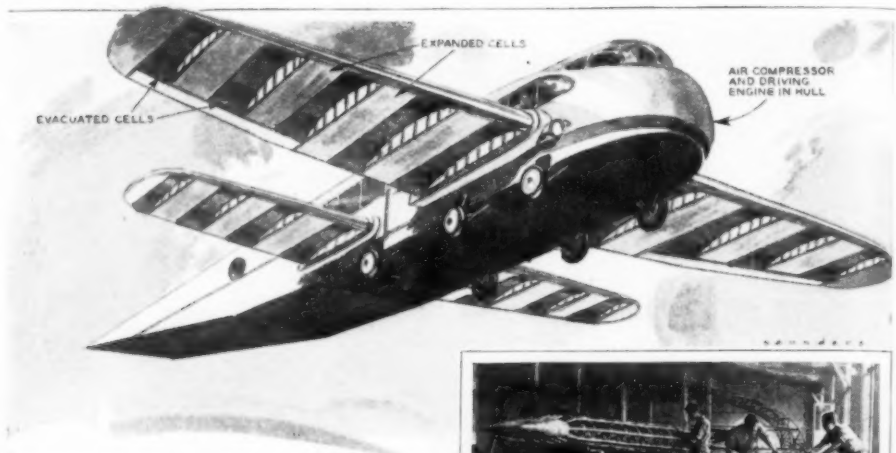
COOLING big cities by means of underground air ducts has long been the dream of inventors and sweltering citizens alike. A plan is now being seriously considered by a Chicago scientist, Dr. Gustav Eglov, of the American Chemical Society.

Dr. Eglov believes that huge refrigeration plants built at intervals of a mile and a half along city streets would rid the canyons between sky scrapers of humid hot air. Giant blowers in the plants would force the cooled air into the streets through ducts, as illustrated in the accompanying drawing. The cold air would hug the streets and walks, displacing the warm air, which would be forced upward. The plan could also call for piping into skyscrapers so as to provide office buildings with air conditioning. A practical street cooling system would be welcomed by store owners in crowded districts, it is believed. The increased patronage would be expected to more than pay for operation of the plants.

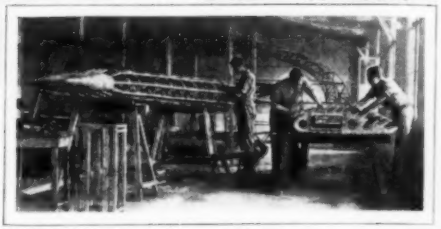


Artist's drawing shows how central air conditioning plants will service streets and offices with cooled air to keep city's inhabitants comfortably cool even in hottest weather. Shops on such streets expect increased patronage to pay costs.

Pulsating Wing to Drive Prop-less Plane



LACKING both propeller and tail assembly and driven only by a 10 H.P. motor, an Austrian plane is expected to take the air this summer. The motor drives a compressed air pump which expands and evacuates a large series of pneumatic air cells in the wings. It is planned that pulsations of these cells will furnish lift and driving power for the ship. By altering the stroke in the rear wing cells, which act as a propeller, the plane is expected to climb, bank, dive, hover and go forward or backward. The forward wing is used primarily for the higher speeds. The framework of the ship is constructed of welded steel tubing.



Workmen are shown building the many-celled wings which are expected to furnish the power for the strange craft.

Model Violin Is Perfect

This miniature violin is a perfect scale model of full-size instruments. Size, 1¼ inches.

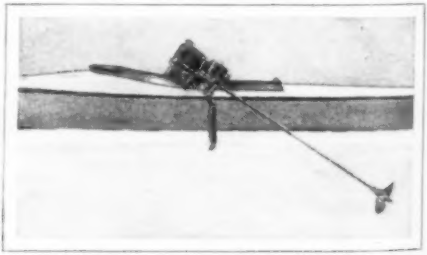
BUILT by a noted violin maker of Pasadena, Calif., this unusually tiny instrument is perfect in every detail. The miniature violin is made of seasoned wood throughout and is fashioned with the same fidelity as in full-size instruments. It has a carved back and front, ebony keyboard and tiny strings. The model weighs slightly less than 1/32 of an ounce. Months of labor were necessary to complete it.

New Motor Clamps to Boat's Side

A NEW swivel motor which clamps to the side of the boat solves the transportation problem for hunters and fishermen whose skiffs are decked over and cannot be fitted with an outboard motor in the stern.

Easily mounted, the one cylinder, 2 h.p. motor consumes about a quart of gasoline per hour and drives the boat at 7 to 11 miles per hour. Water for cooling is taken up by a folding inlet pipe and is discharged through the hollow propeller shaft. Propeller blades are protected by a shear-pin.

The engine is started by a cord and controlled by a single throttle lever. The magneto supplies the ignition and sufficient current for lights.



This new sideboard motor can be attached to any boat, collapsible or otherwise. Weighing only twenty-four pounds, it develops a speed of from 7 to 11 miles per hour.

Radio Eye Sounds Alarm to Protect Home From Burglars

DETERMINED to halt the activities of kidnapers and housebreakers, science has perfected a burglar alarm which not only rings a bell warning the householder but also bathes the invader in a flood of light.

Known as the teletector, the device operates on the newest radio principles, placing over every door and window an invisible electric curtain through which no intruder may pass without immediate detection.

A small insulated wire is concealed in door frames or window casings. Acting as an extremely sensitive antenna, this wire throws a radio field across the space which is to be protected. As soon as a foreign body passes through this space curtain, the electric circuit is broken and the alarm is promptly sounded. A feature recommending the device is the fact that wires are concealed, preventing cutting by the marauder.

This doorway is protected by an invisible electric curtain which flashes a light and simultaneously rings an alarm when a criminal attempts to force his way into the house.

Flexible Magnet Is Handy Device

The flexible shaft of this new magnet permits lowering into many out-of-the-way places.

RECOVERING nuts, bolts, cotter pins and similar articles from inaccessible places is a simple matter with a flexible magnet.

Its long cord enables it to be lowered into boilers, drums or into moving machinery without danger to the operator. The magnet will lift about one pound of steel.

Shaving Cream Rolls Onto Face

A closeup of the roller cap which fits any shaving tube.

AN ingenious roller device which screws onto any tube of shaving cream is the latest gadget designed to make shaving easier.

The cream is squeezed onto the roller and transferred to the face in smooth, even layers, avoiding messy rubbing with fingers, or improper distribution with brush.

Apparatus Measures Body Heat

HAILED as a boon to students of biology, a new medical machine accurately charts the rate of heat production in the human body.

The subject first draws in a quantity of oxygen from a tank and then exhales it into a tube connected with the measuring apparatus. A pen records the rate of heat production on a graph chart.

Drawing in a quantity of oxygen from the tank, right, the subject exhales into the tube leading to the recording machine. Note graph which shows body heat produced.

The Fighting NORTHLAND

by CLARENCE EBEY

Barbering is a crude art in arctic regions.

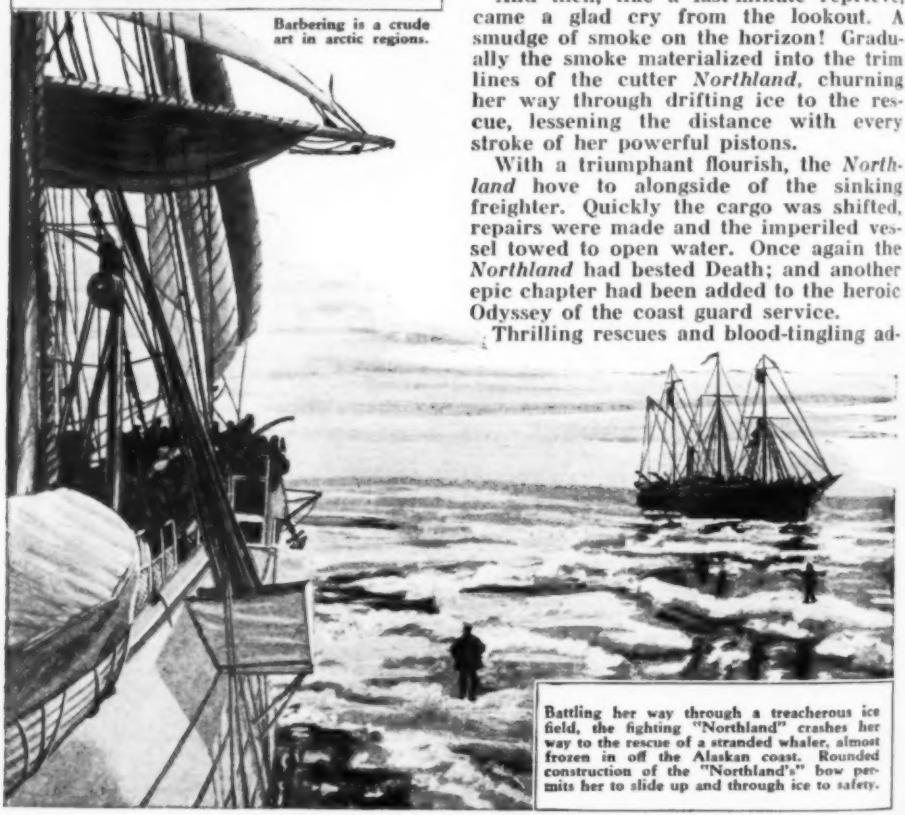
TRAPPED in a field of treacherous pack ice twenty miles off the Alaskan coast, the freighter *Anyox*, two gaping holes in her ice-crushed bow, was slowly settling to her doom.

Twenty-eight hours earlier the ship's imperative distress call had crackled through the arctic ether as desperate men had leaped to lash tarpaulins over the battered bow. The initial rush of the hungry waters had been checked; but not before the hold had partially filled and one of the engine fires had been extinguished. Doggedly the men fought the inevitable, but it was a losing battle. Slowly, inexorably, the clutching waters inched their way upward along the freighter's hull, pulling her ever lower into the trough of the sea. It was the end. The *Anyox* was doomed.

And then, like a last-minute reprieve, came a glad cry from the lookout. A smudge of smoke on the horizon! Gradually the smoke materialized into the trim lines of the cutter *Northland*, churning her way through drifting ice to the rescue, lessening the distance with every stroke of her powerful pistons.

With a triumphant flourish, the *Northland* hove to alongside of the sinking freighter. Quickly the cargo was shifted, repairs were made and the imperiled vessel towed to open water. Once again the *Northland* had bested Death; and another epic chapter had been added to the heroic Odyssey of the coast guard service.

Thrilling rescues and blood-tingling ad-



Battling her way through a treacherous ice field, the fighting "Northland" crashes her way to the rescue of a stranded whaler, almost frozen in off the Alaskan coast. Rounded construction of the "Northland's" bow permits her to slide up and through ice to safety.

RESCUE SHIP of the Arctic

Smashing her way through ice-locked arctic waters, the million dollar "Northland" triumphs over death in an epic battle with the grim menace of the elements.

venture are all part of the day's work for the fighting *Northland*. For approximately six months of every year, from May to November, the sturdy warrior threads the bylanes and the danger zones of the arctic, smashing her way through the menacing ice floes on missions of mercy. Her job is to rescue the lost, succor the needy, heal the sick and to pursue the lawbreaker. The *Northland* is all things to all men —a scourge to evildoers and a savior to the suffering and distressed.

A noble heritage has spurred the *Northland* on. For fifty-four years her predecessor, the famous *Bear of Oakland*, now with Admiral Byrd at the South Pole, braved the menace of the same northern waters. Nearly fifty years ago the *Bear*, then commanded by Commodore W. S. Schley, of Spanish-American war fame, made history when she crashed her way through 1400 miles of ice to find and rescue the members of the Greely expedition at Cape Sabine.

No less than her brave and gallant predecessor, the *Northland* has upheld the glorious traditions of the coast guard service in aiding the helpless and the imperiled in Alaska's far-flung waters. Six full voyages has she made and one of shorter duration, soon after her completion, in 1927. Each has teemed with excitement and has added new luster to the name of the doughty conqueror of the ice-locked wastes.

There was the case of the Norwegian trading steamer, *Elisif*. Caught in a death grip between drifting ice packs and the stationary shore ice near North Cape, Si-

One of the "Northland's" crew demonstrates the latest dance steps to fascimated Eskimo natives aboard ship.

Sub-zero temperatures hold no terrors for two of the parka-clad officers of the "Northland," shown above. At right, the rescue ship's predecessor, the famous "Bear of Oakland," now at the other end of the globe, sturdily ploughing through antarctic ice with Admiral Byrd.

The Northland Rescues Sailors, Ministers to Sick, and Feeds the Natives

beria, the vessel was crushed and partially sunk. After her crew of fifteen had walked ashore over the ice, carrying a portion of the food supplies to the natives, the men took the balance of the ship's stores and boldly set out in two power boats and two barges to reach civilization. For eighteen days they cruised the open sea—500 miles in all—until they finally reached United States territory. At East Cape, near Little Diomede island, the *Northland* found them, suffering intensely from exposure and starvation and took them to Nome.

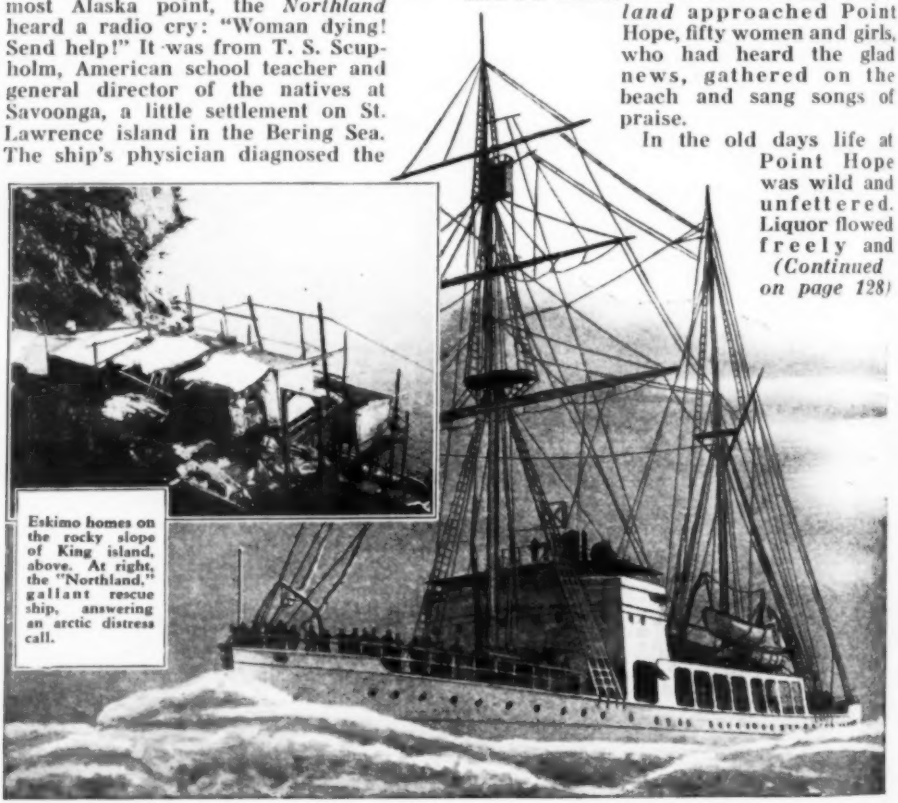
On another occasion, trader Jim Allen and a group of the Eskimos he fathers and counsels at Wainwright, Alaska, were in dire straits. Because the walrus herds which usually drift in on floating cakes of ice had stayed far out that season, the group was facing slow starvation. The *Northland* took the hunters 150 miles out to the ice packs, found a school of walrus and helped the native hunters to shoot five of the beasts.

Cruising near Point Barrow, northernmost Alaska point, the *Northland* heard a radio cry: "Woman dying! Send help!" It was from T. S. Scupholm, American school teacher and general director of the natives at Savoonga, a little settlement on St. Lawrence island in the Bering Sea. The ship's physician diagnosed the trouble and prescribed treatment by radio, as the *Northland* sped along on her 200-mile run. For the last fifty miles the gallant cutter battled heavy fog and menacing blocks of ice. The lookouts could see scarcely fifty feet before them. Mrs. Scupholm was found in a dangerous condition, treated on board the *Northland* and hurried to Nome.

The *Northland's* adventures and services to humanity have been many and almost uninterrupted during her comparatively brief career. On one northward journey she carried a small hand organ, to be used by Archdeacon H. A. Goodman in his Episcopal Mission at Point Hope. On another occasion the *Northland* took the archdeacon on his annual trip from Point Hope to Point Barrow. Learning that his "children," the natives, were faced by a lack of food, the cutter's captain ordered her to cruise until a group of the animals were found sunning themselves on the ice. The crew shot enough to provide meat for the 200 inhabitants of Point Hope until the drifting ice sent the walruses in closer. As the *Northland* approached Point Hope, fifty women and girls, who had heard the glad news, gathered on the beach and sang songs of praise.

In the old days life at Point Hope was wild and unfettered. Liquor flowed freely and

(Continued on page 128)



Eskimo homes on the rocky slope of King island, above. At right, the "Northland," gallant rescue ship, answering an arctic distress call.

Engineers Build Toy Railway That Fills Huge Ballroom

HERALDED as the world's biggest little railway, a miniature transportation system, begun as a hobby, has grown to such proportions that its builders were forced to lease a ballroom in order to display it properly.

Built to exact scale throughout, the model railway is a marvel of mechanical construction. The rolling stock and track equipment, however, represent only one phase of this remarkable project. Miniature towns dot the right-of-way. Model bridges span make-believe rivers. Gentle grades zigzag up miniature mountains. Natural colors create settings of scenic beauty.

One of the builders of the miniature railway examines his handiwork. Note detail of building in the background.

Side Car Serves as Boat

The work of only a few minutes transforms this motorcycle side car into a boat, as shown in the photo above.

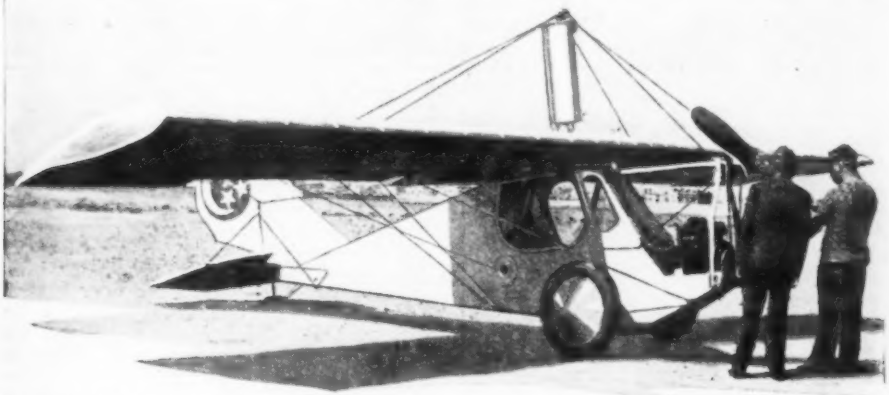
A MOTORCYCLE side car which doubles as a canoe on trips to the beach or river bank has recently made its appearance in Germany. The car is fitted with small metal pontoons which keep it upright in the water. Future models will be fitted with rudders, completing the transformation from side car to a navigable boat.

Monoplane Uses Chain Drive

EGYPTIAN aeronautical experts at the Almaza Aerodrome have succeeded in building a monoplane whose propeller is driven by a chain transmission.

The ship, which has proven exceptionally airworthy in recent tests, is powered by a four cylinder motorcycle engine in an open mounting. The tiny cockpit is large enough to accommodate only one person.

Various difficulties confronting the designers of this light plane were solved in a novel manner. Disposition of the gasoline tank proved a stumbling block which was finally overcome by mounting it on top of the wing. Supporting the wing properly likewise proved troublesome; but a strut attached to the main framework was run through the gas tank, permitting the fastening of guy wires which successfully braced the wing.



Experiments with light planes by Egyptian aeronautical students at the Almaza Aerodrome resulted in construction of this novel one-place monoplane. Powered by a four cylinder motorcycle engine, the plane has a chain-driven transmission. The gas tank is placed on top of the wing and bracing is achieved only by the use of various guy wires.

"Whatsit" Flivver Plane Fools Experts, Flies Without Tail

Above: Waldo D. Waterman stands beside his unique tailless flivver plane. He named the queer craft "Whatsit" because everyone seeing it has gasped, "What is it!" Below is plane in flight. The ship has no tail structure.

SOARING gracefully above the Glendale, California, airport, the "Whatsit" proved its airworthiness by making better than 100 m.p.h. The plane is of the pusher type, and has no tail structure. It was designed by W. D. Waterman of Santa Monica to answer America's need for an inexpensive light plane that would promote aviation among the general public.

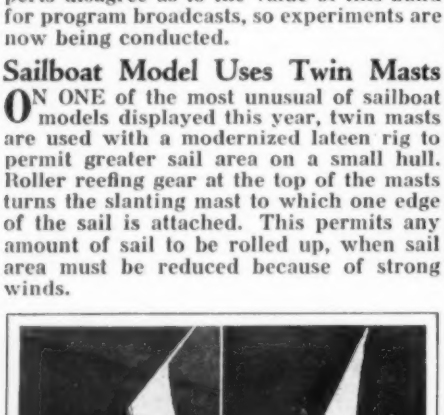
A windshield built into the tiny cabin permits clear vision at a wide angle.

100 K.C. Added to Broadcast Band

A NEW frequency band, 100 kilocycles wide, is now available for broadcasting. Commercial licenses in this region have been shifted to other bands. Technical experts disagree as to the value of this band for program broadcasts, so experiments are now being conducted.

Sailboat Model Uses Twin Masts

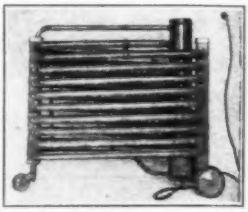
ON ONE of the most unusual of sailboat models displayed this year, twin masts are used with a modernized lateen rig to permit greater sail area on a small hull. Roller reefing gear at the top of the masts turns the slanting mast to which one edge of the sail is attached. This permits any amount of sail to be rolled up, when sail area must be reduced because of strong winds.



Left: Lateen sail of this unusual sailboat model can be rolled up on gaff to reduce area. Right: Model in action.

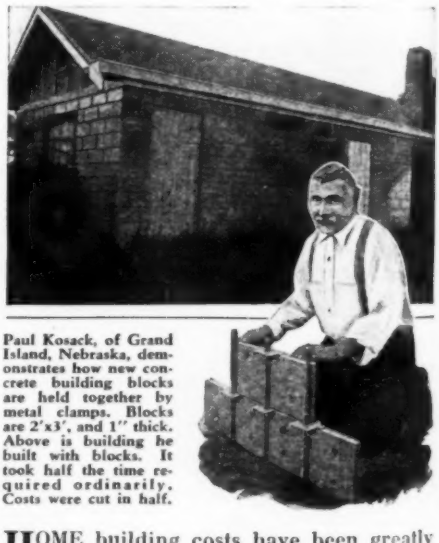
Electric-steam Radiators Are Mobile

THE latest steam radiator to appear in Germany is mounted on casters, and can be pushed from room to room. No pipes or hose connections are needed; an electric device heats the water and develops the necessary steam.



German portable steam radiator plugs into electric outlet. Electricity generates steam.

New Cement Blocks Lock in Place

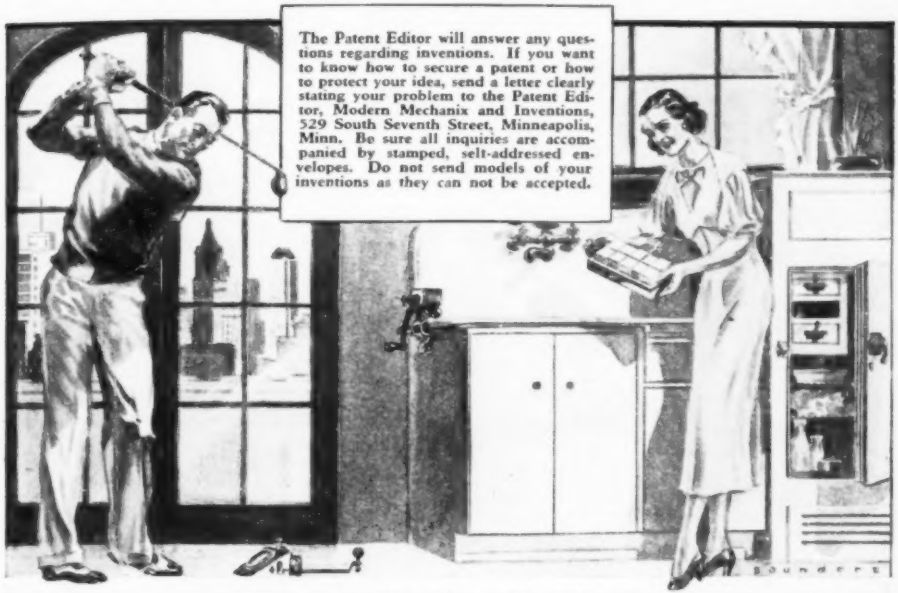


Paul Kosack, of Grand Island, Nebraska, demonstrates how new concrete building blocks are held together by metal clamps. Blocks are 2'x3', and 1" thick. Above is building he built with blocks. It took half the time required ordinarily. Costs were cut in half.

HOME building costs have been greatly reduced by a Nebraska inventor. He uses concrete blocks about one inch thick and two by three feet in area for the walls of homes. Inside walls are placed six inches from the blocks, and the space between filled with cement. The concrete slabs are held together by metal clamps.

Seek Wealth In These Needed Inventions

The Patent Editor will answer any questions regarding inventions. If you want to know how to secure a patent or how to protect your idea, send a letter clearly stating your problem to the Patent Editor, Modern Mechanix and Inventions, 529 South Seventh Street, Minneapolis, Minn. Be sure all inquiries are accompanied by stamped, self-addressed envelopes. Do not send models of your inventions as they can not be accepted.



The inventor who can produce a home golf practising device would probably make a fortune. The machine, selling for two dollars, should show how squarely and how hard a captive ball is hit. Although rubber trays now do the work, a metal tray is in demand that will release ice cubes by pressing a button.

IT IS gratifying to the Editor of this Department to note the rapidly increasing interest in inventions on the part of the readers of MODERN MECHANIX AND INVENTIONS. The mail recently received proves that many fellows have come to realize that the same effort that they put in on the construction of various gadgets "just for the fun of it" can be used to create some truly novel article. In short, they see where the inventive talent that they use every day can be turned into real money-making channels.

Great Demand for Little Inventions

There is still a tremendous need for little inventions that can be made quickly and sold easily. Take the matter of the savings bank as an example. Who can make a simple bank that will sell for a half dollar and that will register the amount of money it contains? If a quarter is dropped in, the bank automatically adds that amount to the figure posted. The whole idea could be built upon the fact that each piece of change in the American currency is slightly different in diameter. Here would be a big seller and a big money-maker.

What automobile driver of any experience has not had the job of righting a car with a wheel missing after it had fallen off the jack? The question is "Why do cars fall off jacks?" and the inventor answers logically enough, "Because the base of the jack is not large enough." However, if the bases of jacks were made larger, they would be too cumbersome and would not fit so conveniently in the tool kit. Why not, then, design some sort of jack with a collapsible base that would provide twice the area now used? The idea probably would be a winner.

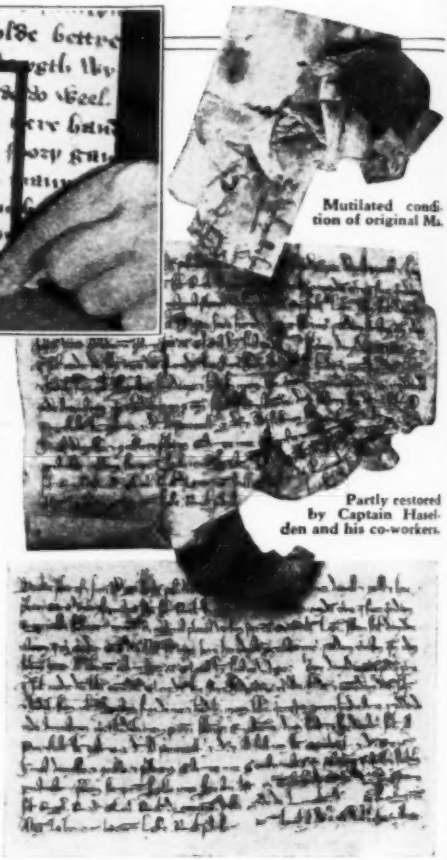
Carpenters and other mechanics are constantly having the edges of their chisels nicked by permitting them to jangle with other tools in the kit. Why not some sort of a little pressed metal gadget that could be slipped over the edge of a tool when it was not in use to preserve the edge? These articles should be so simple that they could be sold for a nickel apiece.

Among the toys of older boys there should be such a thing as a tri-ice-cycle—new word for the dictionary and a new thrill for children. This article would look very much like an ordinary tricycle save that it would have runners in place of wheels and some sort of a device would have to be developed that would propel the vehicle as the youngster peddled. The propelling device would have to take the form perhaps of a belt with spikes in it to engage the ice and snow.

(Continued on page 142)

Solving MYSTERIES *of*

Possible forgeries in old writings are checked with this glass measuring device. Ruled lines permit the operator to measure the slopes and angles of the doubtful letters.



Mutilated condition of original Ms.

Partly restored by Captain Haselden and his co-workers.

Arduous work by scientists attached to the Huntington Library succeeded in restoring this almost hopelessly mutilated document, a thirteenth century land grant.

MYSTERIES among the manuscripts—the forgeries, erasures and obliterations that once balked the student of historic writings—are mysteries no longer. For modern science detects the spurious document, supplies the missing words and forces the ancient vellums to give up their time-guarded secrets.

Take, as an example of word-for-word forgery, the letter written by Abraham Lincoln to Alexander H. Stephens, November 30, 1860, which recently came under the scrutiny of Captain R. B. Haselden, curator of manuscripts at the Huntington Library at San Marino, California.

When Captain Haselden first examined the letter he noticed several stains, not in themselves proof of forgery, but nevertheless sufficient to arouse his suspicions. The curator repaired to his laboratory and submitted the questioned document to the searching eyes of his binocular microscope and his ultropaque microscope.

How Forgeries Are Detected

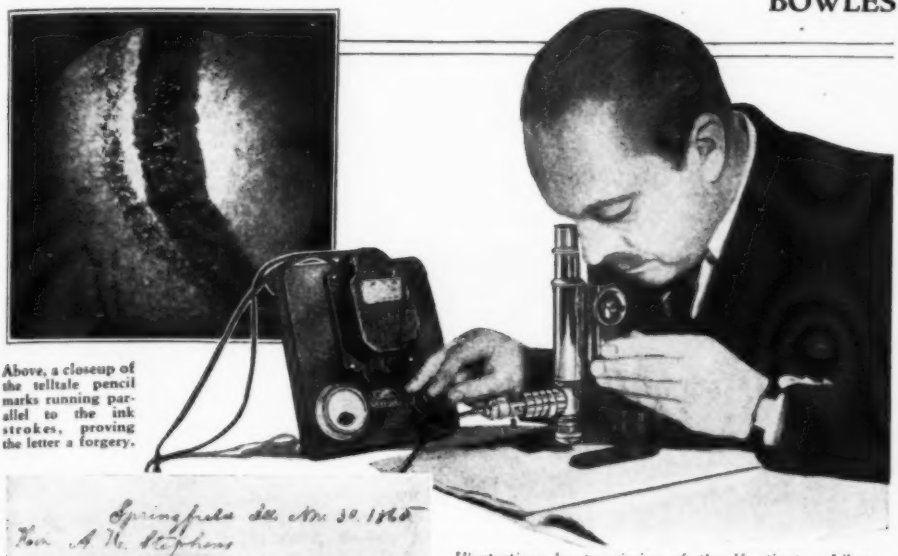
"Under the binocular microscope, thru which I study the individual letters," said Captain Haselden, "I could see the pen-lifts, variations in pen pressure and other details which indicated forgery. Tests with measuring instruments, which enable me to compare intimate details with specimens of Lincoln's writing which we know to be genuine, confirmed my suspicions.

"Further, I saw under the ultropaque microscope the heavy lead of pencil marks, underneath and paralleling the pen strokes, stamping it conclusively as a forgery. Later we discovered in the library a duplicate letter which our tests proved to be the original. When we compared the two by means of uniform ruled glass squares I saw the forger had not actually traced his letter from the original, though he must have had the original before him since he reproduced it with such exactitude."

Another letter dated February 22, 1879, ostensibly was written by the same Stephens to Henry Whitney Cleveland. This note referred to the proposed altered confederate flag. But it was spurious! When keen eyes looked through the paper as it lay over a light on a small square of ground glass on the viewing table, they read the date of the water mark: "1898". Proof conclusive of forgery, for the paper had not been man-

Ancient Manuscripts

by JAMES BOWLES



Above, a closeup of the telltale pencil marks running parallel to the ink strokes, proving the letter a forgery.

Illustrations by permission of the Huntington Library, San Marino, California.

Springfield Ill. Nov 30. 1860

Hon A. H. Stephens

My dear Sir.

I have seen in the newspapers your effort recently delivered (I think) before the Georgia Legislature or its assembled members — If you have revised it as is probable, I shall be much obliged if you will send me a copy —

Yours very truly

A Lincoln

Although seemingly genuine, the Lincoln letter (above) told a different story when it was submitted to the scrutiny of the ultropaque microscope, shown at right above. This instrument contains its own illumination, the light shining on the specimen through a ring around the lens.

The discoverer of this old document never dreamed that it contained two messages, one invisible to the eye, until scientific instruments disclosed the long-guarded secret.

ufactured until nineteen years after the date borne by the letter.

No matter how old the manuscript, it can often be tricked into revealing not only physical facts about itself, but also collateral information throwing important light on the life of the author. Take the case of a priceless manuscript from the hand of Valerius Maximus, inscribed in the late fifteenth century. Here ultra violet light and microscopic studies revealed several interesting facts as Capt. Haselden turned black writing white against the remnants of a lower and much older writing which had been obliterated.

Invisible Writing Disclosed

Photographed in daylight, the vellum appeared to be an ordinary manuscript in Latin, written about 1480. Then the ultra violet light was applied, and a second picture revealed a lower layer of writing, visible even though it had been almost destroyed by milk or pumice. The lower text crossed the upper, having been written lengthwise on the pages.

But there was inadequate contrast. The lower lines could not be read. So by a photographic trick the upper lines were turned white and photographed against the black background of the older lines. Then they stood out in sharp relief and together the

(Continued on page 126)

Boy Giant, 8 Feet Tall, Weighs 365 Pounds

Robert Wadlow, 16-year-old Alton, Illinois, schoolboy giant, towers high above his classmates. He now is 7 feet, 10½ in. tall. He weighs 365 lbs., and gains 25 lbs. a year.

ALTHOUGH but sixteen years old, Robert Wadlow, Alton, Illinois, schoolboy giant is 7 feet, 10½ inches tall and weighs 365 pounds. Robert added two inches to his height in the last year, and gained twenty-five pounds. At this rate it will not be long before he will be holding world's records for tallest and heaviest men.

Doctors are watching him closely, trying to discover the reason for his unusual growth. They do not allow him to participate in high school sports.

Electric Needle Draws Designs

A TINY electrical device which perforates tiny holes in paper or cardboard as easily as a pencil makes lines has recently appeared on the market.

A small electric motor built into the handle makes the perforating needle flash in and out hundreds of times a minute.

With this device perforated designs can be made on a stencil or piece of paper as easily as they could be drawn. There is no danger of tearing the stencil or causing blurs on the copies. The speed of the pin can be adjusted to vary the spacing.

Midget electric perforating device cuts paper stencils. Needle flashes in and out rapidly.

New Gas Mask Permits Talking

CALLED the greatest improvement in rescue equipment in a decade, a new gas mask permits clear speech in perfect safety. Firemen and rescue workers can now issue orders in gas or smoke-filled air. An ingenious acid, heat, and fume-proof diaphragm of micarta built into the mouthpiece transmits speech naturally, without any distortion. With older types of masks communication could only be carried on by hand signals, or by tapping out messages in the Morse code.

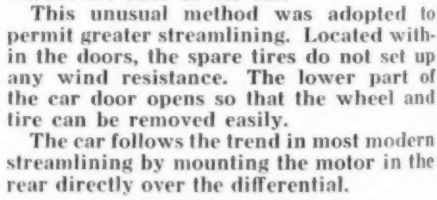
Special micarta diaphragm built into mouthpiece of this new gas mask permits user to talk.

Spare Tire Hidden in Auto Door

LATEST innovation in English automobile designing is a spare tire compartment within the door of the car.

This unusual method was adopted to permit greater streamlining. Located within the doors, the spare tires do not set up any wind resistance. The lower part of the car door opens so that the wheel and tire can be removed easily.

The car follows the trend in most modern streamlining by mounting the motor in the rear directly over the differential.



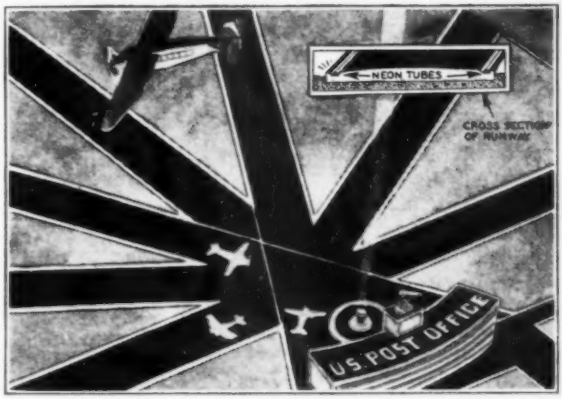
New English automobile has engine above rear wheels, and spare tire mounted in door to aid stream-lining effect.

Glow Worm Lights to Replace Blinding Airport Beacons

AIRPORT searchlights and beacons would be eliminated by a system of "glow worm" illuminated runways now under consideration by leading aeronautical experts.

The "glow worm" lights are neon tubes. These would be placed in depressions on the sides of the runways. Neon lights would also be placed along the edges of all buildings and obstructions at or near the airport.

A "glow worm" airport, it is believed, would make night landings much safer. Experts studying it include Capt. C. H. Biddlecomb, world war aviator, and Clarence Chamberlin, veteran flyer.



Airport runways outlined with neon tubes would replace glaring searchlights and make landings safer. Inset shows tubes fitted into troughs.

Death Trap Electrocutes Insects

Light trap which electrocutes insects in orchards. Strong light lures unsuspecting moths, who die when they come in contact with high voltage wires. Pan collects dead insects.

THE recently developed "electric eye" is now being used in a war on insects. Orchard owners of Hilton, New York, have installed these photo-electric cell units to turn on electrical insect death traps at dusk and turn them off at dawn.

The traps each have a powerful electric light bulb surrounded by high voltage wires. Moths attracted to the light come in contact with the wires and are killed.

Tablet Closes Gap in History

PROFESSOR James H. Breasted of the University of Chicago is studying an ancient tablet that is expected to fill in important gaps in Assyrian history. The newly discovered tablet contains 350 lines of well preserved cuniform summarizing the reigns of 95 kings, covering the period from 2700 B.C. to 746 B.C. The tablet was found at the site of an ancient library in Irak.

Meat Eating Sea Plant Found

MEAT eating sea plants that paralyze their food with poison have been found off Porto Rico. Officials of the Smithsonian Institution say that the plants are actually highly developed animals. They resemble plant life only in outward appearance.

The "plant-animals" eject a poison at any passing sea creature. The paralyzed victim is then gathered in by tentacles that line grooves in the arm of the plant. The plant's bright colors fade when taken out of water.

Hammer Has Removable Heads

HAMMER faces on a new tool placed on the market can be replaced when worn out. The faces are covered with rawhide and the hammer can be used for delivering light or heavy blows without making dents. A lock nut holds the insets firmly in place. Copper and Babbitt insets are also available.

Top photo shows how worn out faces can be removed from hammer. The insets are held in place by a lock nut.

SPORTSMEN'S Bait Casting and

by **ROBERT PAGE LINCOLN**
Hunting and Fishing Editor

BEFORE starting out on that fishing trip this summer know what equipment you will need. The fisherman should not carry more than is necessary, yet he should have the flies, lures, tackle and rods that will answer all conditions with which he will be confronted.

Fly fishing and bait casting require a rather thorough knowledge of the equipment that is offered on the market today. We will discuss the requirements of the fly fisherman first and then take up bait casting.

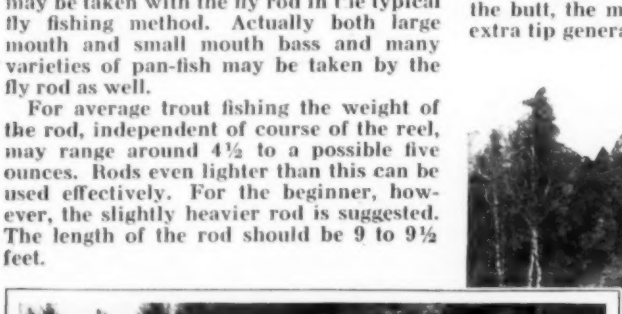
Some fishermen believe that trout alone may be taken with the fly rod in the typical fly fishing method. Actually both large mouth and small mouth bass and many varieties of pan-fish may be taken by the fly rod as well.

For average trout fishing the weight of the rod, independent of course of the reel, may range around 4½ to a possible five ounces. Rods even lighter than this can be used effectively. For the beginner, however, the slightly heavier rod is suggested. The length of the rod should be 9 to 9½ feet.

The material composing the rod must be given careful thought. Selected bamboo, picked from butt-cut Tonkin, is considered by all authorities as being the best that the market has to offer. Selected Calcutta bamboo also is used in excellent rods.

Solid wood fly rods are practically a thing of the past. The new high-quality, lightweight, tubular steel fly rods, now on the market, combine lightness with a strength far exceeding that of bamboo. Such a rod, the writer believes, will satisfy the demands of those looking for an all-around or all-purpose fly rod.

Only the 7½ or 8 foot lightweight rods come in two pieces, namely, the butt-piece and the tip. Regulation trout and bass rods in the fly rod class come in three pieces, the butt, the middle joint and the tip. An extra tip generally goes along with the rod.



The author is shown fishing a northern trout stream. A well made bamboo fly rod is best suited for such conditions. Other equipment needed is listed in the article.

Robert Page Lincoln caught this splendid trout with a solid steel bait casting rod, useful for all-around fishing for either trout or bass.

CAMPFIRE

Fly Fishing

This successful fisherman has a rod with automatic reel.

Here are a few of many lures for the angler's tackle box.

By alternating the use of these tips they will last that much longer.

Fly rods meant for bass fishing are likewise offered in bamboo material, but are heavier. They are stiffer, because lures used are heavier. Bass rods range 5½ to 6½ ounces in weight. The weight selected should depend on the strength of your wrist. The 6½ ounce rod may be difficult for the average man to handle hour in and hour out. Experiment with rods by fitting them with reels.

The reel on the fly rod should balance up more or less perfectly with the rod. If the reel is too light or too heavy there will be little ease observed in casting, and the wrist will tire. The reel, with the line on it, should weigh 1½ times the weight of the rod. With the reel attached to the rod you should be able to balance it on your fore-finger, the balancing point being just a few inches forward of the metal tapercheck of the handgrasp.

Shall it be a single-action or an automatic reel? The latter has become very popular due to its greater efficiency in handling the line. Added to this, the automatic reel more nearly assures you the proper weight in balancing up your outfit. Most single action fly reels are light and give no balance whatever. The automatic reel leads in preference for ninety per cent of all fly fishing done, either with the trout rod or the bass rod.

Just as it is impossible to use a typical bait casting reel on a fly rod, so it is impossible to use the typical soft, or hard-braided, bait casting line. It is necessary to use an enameled line in fly fishing.

Fly lines are made in different sizes, ranging heavy, medium and light. Some manufacturers use letters in designating the caliber of their lines while others use numbers. Thus C is the same as Number 1; D is 2; E is 3; F is 4; G is 5 and H is 6. To pick a 5 or 6 caliber line for a 6 or 6½ ounce fly rod means uneven balance. In proportion to how heavy the rod is and

(Continued on page 130)

SPORTSMEN'S

Timely Kinks on the Use of Outboard Motors for Fishing

A boat equipped with an outboard motor is ideal for fishing. A flat or V bottom boat is the safest type.

Robert Page Lincoln tells you how to put an outboard on a canoe, how to use two canoes with one motor, and the best speed needed for trolling. Included also are a few useful tips on proper fishing methods.

THE use of the outboard motor in water travel and in fishing greatly adds to the pleasure derived from such recreation. Either the familiar single or twin type of motor is excellent for the purpose, is easily transported, and is light in weight.

A typical flat-bottomed or V bottom boat is ideal to use in combination with the outboard motor because one can move about in the boat and stand up while fishing without much danger of upsetting.

It is possible to use both the twin model and single outboard motor on the ordinary sharp bow and sharp stern canoe. For the purpose a special bracket is lodged on a wooden block fixed between the gunwales near the stern, permitting adjustment of the motor on the projecting arm.

Outboard Drives Two Canoes

Another way to use an outboard motor is to join two canoes together with 2x4s reaching across the gunwales near the stern and bow. The 2x4s, bolted or clamped in place, hold the two canoes rigidly parallel. Sufficient space should be provided for between the boats to provide free manipulation of the motor. The outboard is fastened between the canoes to the 2x4 near the stern.

A flat-bottomed boat suitable for river travel and fishing can be rigged out with a steering wheel with ropes attached to the motor so that one can sit in front and steer. A boat of the sort should also be provided with slats nailed to a framework to keep the feet and goods off the bottom.

In trolling with an outboard motor, pushing either the canoe or the boat, go at a rate of speed equal to three miles an hour,

The outboard relieves the fisherman from rowing to a favorite fishing spot. Best trolling speed is 3 miles per hour.

which is equal to an ordinary walking pace. Some prefer trolling at less than this speed, just sufficient to keep the motor going, but this is mainly the case when deep trolling. When trolling off of the reefs in deep water go to a depth of fifteen to thirty feet, keeping your lure two to five feet off the bottom. For deep trolling employ a dipsey sinker 10 to 12 ounces in weight arranged six to eight feet ahead of the lure. Troll with a long line, preferably 75 feet. Most trolling is conducted too close to the boat, which accounts for such poor luck. For wall eyed pike, use a June-bug spinner with a minnow on the hook, or any one of numerous types of wobbling spoons to be had on the market.

Spot Fish With Decoy and Smoke Catch This Easy Way

CATCH more fish by using a toy balloon decoy! That sounds like a tall fish story, but fishermen on Otter Tail lake in Minnesota claim it is the latest method of catching fish.

The story was told by a noted fisherman of the lake. He said he carried a toy balloon in his pocket. When he caught a small pike, he inflated the balloon and attached a long cord. The other end of the cord he fastened to the tail fin of the pike.

He set the fish free and followed the floating balloon over the water until it stopped. At the spot the fisherman said he found a school of fish and had no trouble catching his limit.

A small pike with a balloon tied to its tail acted as a decoy in locating a school of fish, a fisherman claims.

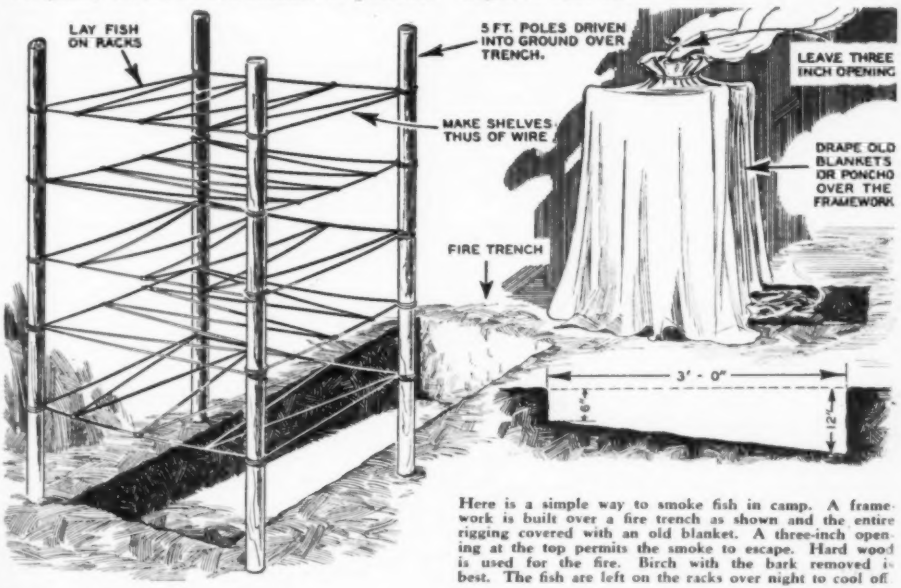
Preparing Fish for Smoking

Another Minnesota sportsman has suggested a very practical way to smoke fish in camp so that a catch can be preserved for some time. A trench, three feet long, is first made sloping in depth from six inches to one foot as shown in the drawing below.

Four poles about five feet long are driven into the ground. Five layers of wire are wound around and between the poles to form shelves. The fish are laid on these poles and the entire rigging covered with wet gunny sacks, an old blanket or poncho. The covering is arranged with a three or four inch opening at the top.

The fish must be cleaned but not scaled. The heads are left on. The whole fish is dried with a towel and ordinary salt rubbed in and left to dry for an hour. A large fish will take about four hours of smoking. Do not let the fire get hotter than the hand can bear. Test the temperature at the top.

Use hard wood to smoke with, preferably birch with the bark removed. After smoking, the fish must be left in the house overnight to cool off.

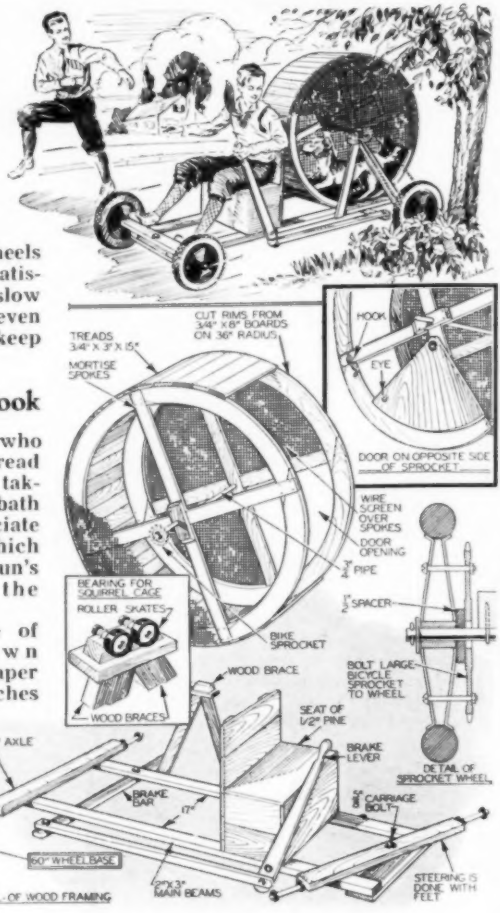

LAY FISH ON RACKS
5 FT. POLES DRIVEN INTO GROUND OVER TRENCH.
LEAVE THREE INCH OPENING
MAKE SHELVES THUS OF WIRE
DRAPE OLD BLANKETS OR PONCHO OVER THE FRAMEWORK
FIRE TRENCH
3' - 0"
6"
12"

Here is a simple way to smoke fish in camp. A framework is built over a fire trench as shown and the entire rigging covered with an old blanket. A three-inch opening at the top permits the smoke to escape. Hard wood is used for the fire. Birch with the bark removed is best. The fish are left on the racks over night to cool off.

"Bruno-Mobile" Midget Car Has One Dog-Power Engine

YOUNGSTERS will have great fun with this unusual "dog-powered" midget auto. The design is here laid out to the correct size for a fox terrier "engine"; police dogs will require a larger wheel. A bicycle sprocket and chain drive is used, the larger sprocket being on the driving wheel shaft; the gear reduction obtained here allows even a small dog to propel this car at a satisfactory rate.

Ball bearings made of roller skate wheels are best for supporting the cage. A satisfactory brake is easily made, and will slow down the novel vehicle quickly, even though the motive power is inclined to keep running.



Paper Sun Shade Fits Any Book

Cardboard tabs are inside covers.

ANYONE who likes to read a book while taking a sun bath will appreciate this device which keeps the sun's glare off the pages.

A piece of heavy brown wrapping paper about ten inches long by twelve inches deep is folded in a fan-like manner to form the shade. The ends of the paper are pasted to tabs of cardboard which can be inserted in the book next to the front and back covers to support the paper. The shade can be left in when the book is closed.

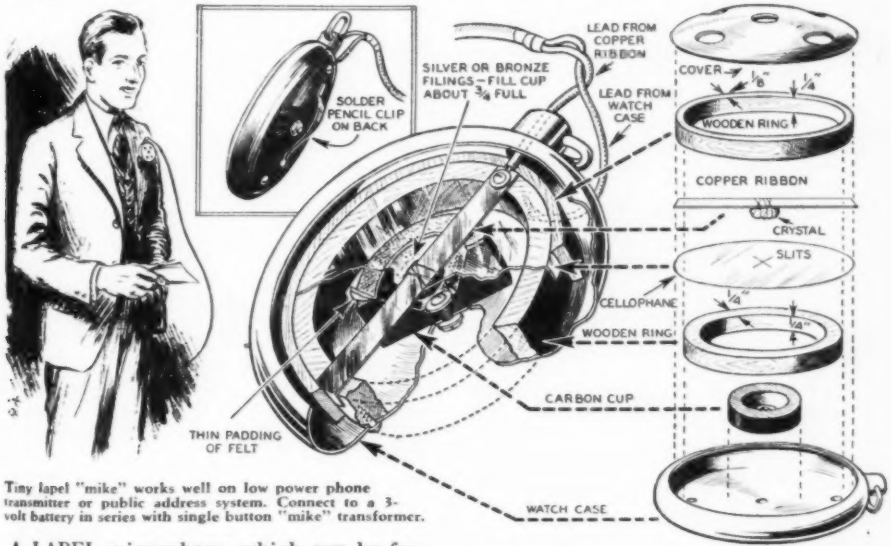
Generate Hydrogen Gas to Fill a Toy Balloon for Drifting Experiment

AN ordinary toy balloon, properly filled with hydrogen gas, will travel a long distance when weather conditions are favorable. Attach identification tags with your name and address, set the balloon adrift, and the results may surprise you.

Hydrogen gas is not hard to make, and is much better than ordinary city gas for balloons. Cut some zinc, such as can be obtained from the casing of any dry cell, into strips that will fit into a pop bottle. When you have several ounces of zinc in the bottle, pour in two ounces of concentrated hydrochloric acid, and slip the opening of the balloon over the bottle top. Fill the balloon to about two-thirds of its maximum capacity, so it will not burst when it reaches higher altitudes.

Balloons have been known to go hundreds of miles in a single day before coming down.

Single Button Lapel "Mike" Can Be Built Into Watchcase



Tiny lapel "mike" works well on low power phone transmitter or public address system. Connect to a 3-volt battery in series with single button "mike" transformer.

A LAPEL microphone which can be fastened to the amateur's coat and carried with him as he moves about is a valuable addition to any "ham" transmitter.

The case from an old dollar watch makes an ideal shell. Replace the crystal with the solid back from a similar watch.

Turn out two concentric wood rings which will fit snugly one inside the other, and just go into the watch case. Fasten the inner ring to the case with short screws.

Cut out the carbon cup from an old dry cell electrode, and glue felt to the rim, to act as a buffer for the diaphragm. Bolt the cup to the case.

Cut a ribbon ¼" wide, of length equal to the diameter of the outer ring, from thin copper foil. Fasten a small piece of detecting crystal to the middle of the strip with fine, thread-like copper wire.

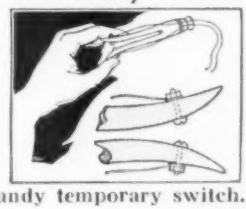
Cut a disc the diameter of the larger wood ring from a sheet of unwrinkled cellophane, and make two short cross slits in the center. Push the crystal through the hole.

Fill the carbon cup ¾ full of silver or bronze filings. Metal filings tend to eliminate the annoying "hiss" of carbon granules.

Place the cellophane diaphragm, with crystal in the filings cup, over the inner ring. Press the outer ring down carefully until the cellophane is well stretched.

Fasten one lead to the ribbon with a washer and screw, the other to the case. Drill about five half inch holes in the front cover, to allow sound to reach diaphragm.

Clothespin Makes Handy Switch



MOUNT two brass bolts with the heads facing each other at the ends of the tines of a clothespin. Run lead wires to the bolts, and you have a handy temporary switch.

Smallest Broadcasting Station

View of completed radio transmitter built into cake pan. Holes are cut in top of pan for tube sockets. Filament switch is in front of left tube. Use large condenser dial. Keep mouth ten in. from transmitter when broadcasting.

Get "on the air" immediately with this cake tin radio station; it broadcasts through your own radio set from any room in the house with no external connections.

MANY of us dream of some day operating gigantic broadcast transmitters—of using powers of 500,000 watts and more to send our voice to listeners all over the world. Some of us may realize this dream—others will not.

Most of us, however will get just as much pleasure in building and operating this "cake pan" set, the *smallest* broadcast transmitter in the world. It will sound as well over your radio as many of the regular broadcast stations—so well, in fact, that you can fool your audiences in countless ways. Faked police alarms, messages from Mars or from some far off part of the world, or musical programs with home talent are easy to stage with this transmitter.

Broadcasts can originate from any room in the house; two units and two radio-sets make a two way wireless communication system that is equal to the inter-office equipment used by many business firms.

No connections to power lines or to the radio set are needed—just a single ground wire.

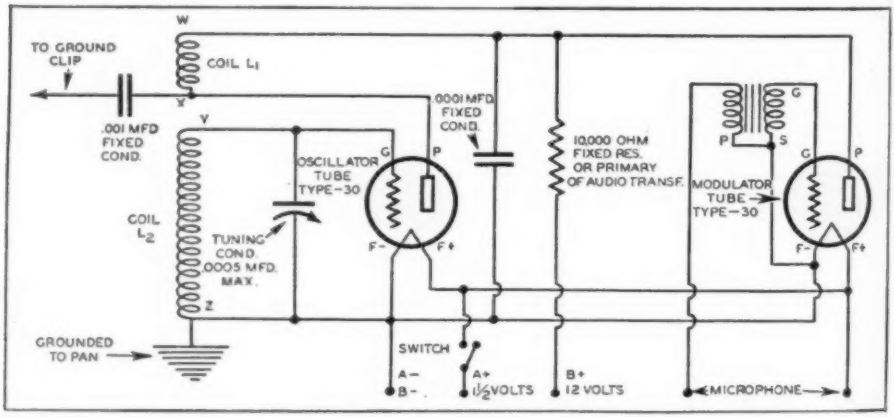
Costs Little to Build

Get "on the air"—a few dollars will buy all of the parts needed.

With only twelve volts of B battery, obtained from flashlight cells, and two cells for the filament supply, this transmitter has broadcast with excellent volume between rooms several floors apart.

All parts are mounted in one end of the pan as shown. This leaves the other end for batteries. Eight batteries in series make up the plate supply, and two in parallel the filament power. The flashlight cells are connected up, bound together in a single unit, and covered with melted sealing wax.

Tubes used are the low drain type —30's. Of course, if the device is not intended to be a portable affair, other tubes such as the



Circuit diagram of the cake tin transmitter. Note that frame of tuning condenser, negative filament leads, and one side of .0001 mfd. condenser are grounded to pan. Parts needed are: 2 four-prong tube sockets, panel type; 10,000 ohm fixed resistor (or audio transformer); microphone transformer; single button mike; .0005 mfd. tuning condenser; .001 mfd. fixed condenser, .0001 mfd. fixed condenser; filament switch; cake pan; and wire for coil

Fits in Cake Tin

by THOMAS A. BLANCHARD

171, 112, or 201-A types using more filament power can be used.

A regular telephone transmitter, any single button carbon mike, or the microphone described on page 23 of the 1934 Modern Mechanix How-To-Build-It book will be satisfactory. Do not attempt to use a condenser mike.

Solder All Connections

In wiring the transmitter use heavy wire and solder all connections well. Since the transmitter is in a metal case be sure that none of the wires are accidentally grounded. Lining the inside of the cake tin with insulating paper will prevent trouble.

To use the transmitter set the dial on your receiver to a location where no stations come in. Connect the one transmitter lead to a ground. It will be best to use the transmitter in the same room as the receiver, until you are familiar with tuning procedure.

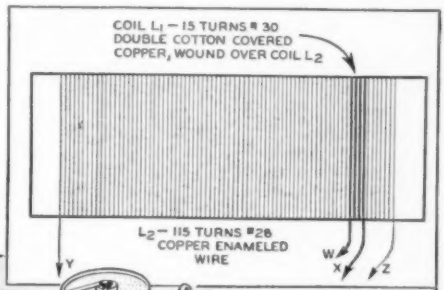
Next, slowly turn the transmitter dial until a sharp whistle is heard through the broadcast receiver. Carefully tune for greatest volume while talking into the microphone. The transmitter is now tuned to the receiver.

The whistle mentioned above and any accompanying sound distortion can be eliminated by moving the transmitter to the basement or some distant room.

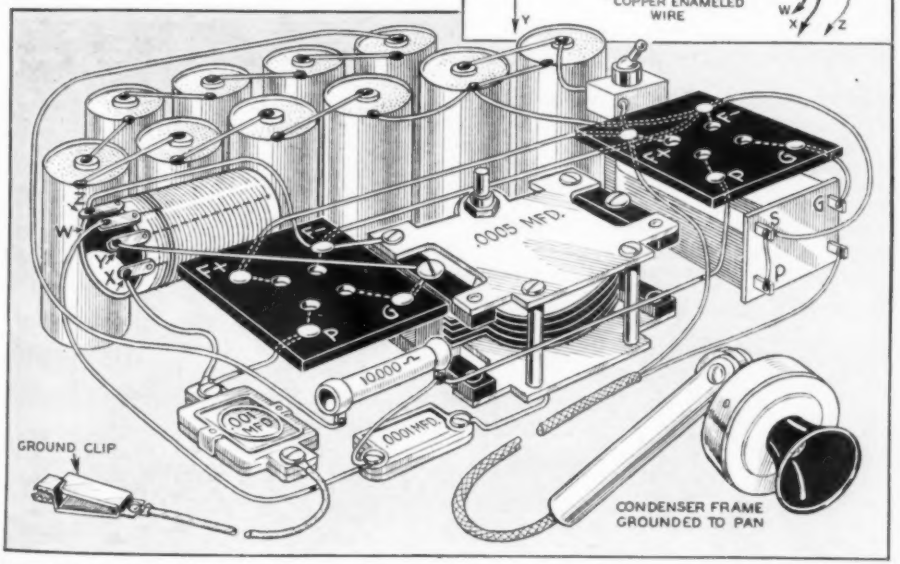
If a telephone transmitter is used, keep about ten inches away from the mouthpiece when you speak.

Due to the extremely low power used it will be impossible for signals to travel any distance. As NO antenna is used NOR should be used, the builder is not violating any federal radio laws by using this transmitter.

Of course, if the current supply is increased and a regular antenna and ground system installed this little device could send a signal possibly 25 miles. *Under no conditions is the builder to use an antenna* unless he has an amateur radio license and uses a coil coming within the assigned "ham" band.

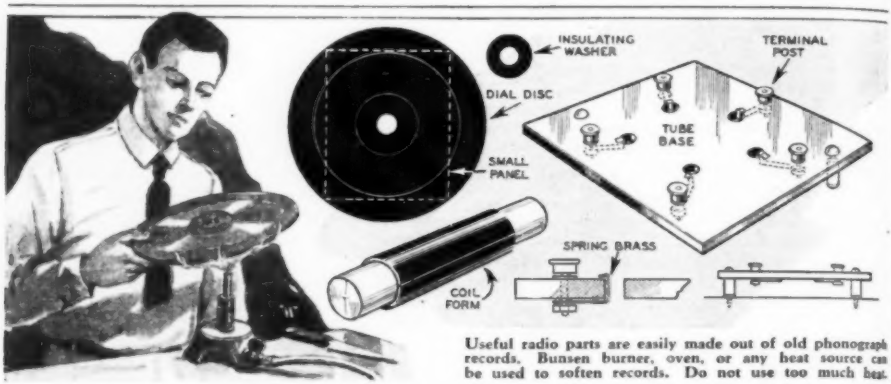


At right: Schematic diagram of coil. Use cardboard or fiber base around 1¼" diameter by 2½" long. Wind coil L-2 first, in single layer with no spacing between turns.



Transmitter as it appears when cake tin is removed. Batteries are on end here to show connections. Condenser shaft, tube sockets, and filament switch are mounted on top of cake tin. Ground and microphone leads run through holes in side.

Making Useful Radio Parts From Phonograph Records



Useful radio parts are easily made out of old phonograph records. Bunsen burner, oven, or any heat source can be used to soften records. Do not use too much heat.

OLD disc phonograph records can be turned to good account as tube bases, coil forms, insulating washers, small panels, and dials.

Heat the records gently in an oven, placing them on a piece of flat tin or sheet iron. When they are soft, but not melted, they are cut to the desired shape. Records may also be heated over a bunsen burner.

Bend pieces of the records over desired diameter cylinders to make coil forms.

Cut out insulating washers with a panel cutter or razor blade attached to a compass.

Tube sockets should be cut 2½" square. Spot the tube holes and drill slightly larger than the tube prongs. Drill holes for binding posts at the corners, and run thin strips of spring brass from each binding post up through the tube prong holes.

Simple Remote Control for Volume

TO REDUCE in volume or cut out entirely an annoying radio program from any remote point in the house, cut the aerial wire, and run twisted leads to the desired location of the remote control. Connect leads to a 23 plate (.0005 mfd.) variable condenser mounted in a neat box. This added capacity will not affect quality of signals.

Hang Watch on Mike to Modulate

FREQUENTLY, when calling a fellow amateur, the "ham" has occasion to move from the transmitter, leaving the carrier wave unmodulated. A watch hung on the microphone will produce a steady signal.

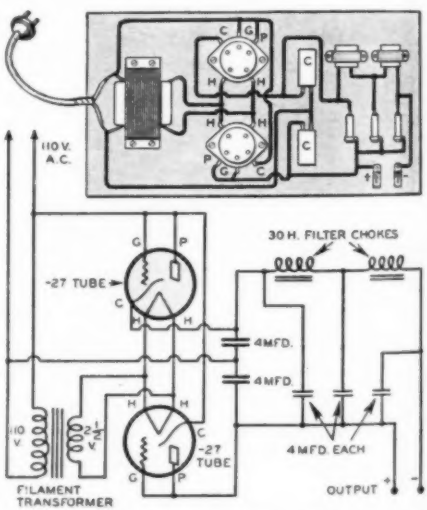
Build '27 Doubler "B" Eliminator

HERE is a full wave 110 volt a.c. "B" battery eliminator, using the voltage doubler principle, which will deliver around 135 m.a. at 200 volts plate supply, without any power transformer. Two easily obtained type —27 tubes here give the same results as the new 25Z5 tube.

Condensers C are common paper condensers, which need not be rated at more than 200 volts for an input voltage of 110 volts. These condensers double the line voltage.

Increasing the capacity of the condensers C increases the output.

Since one side of a power line is always grounded, this eliminator will not work when the radio is connected directly to ground. Place an .00025 mfd. fixed condenser in series with the radio set ground.



Lawn Swing Made From SCRAP Parts

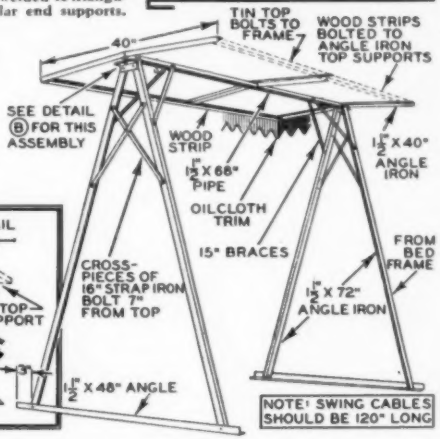
Grown-ups as well as children will be pleased with this gaily decorated lawn swing for two; and it's easy to make.

A STURDY and attractive lawn swing for two persons can be made from parts easily obtained at little or no cost. A few coats of bright green and white paint and oilcloth or canvas for the awning results in an inexpensive swing with a bit of modernistic trim.

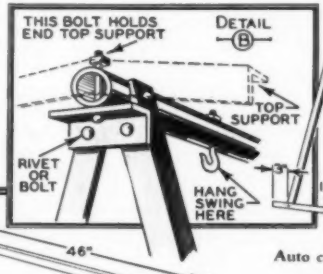
This swing consists of three units: the frame, the top, and the seat. The frame is made up of 1½" angle iron, such as can be obtained from an old bed frame. Two 6-ft. lengths are bolted to the 4-ft. base to form the triangular-shaped supports for each end. The ends are reinforced by two crosspieces, 16" long, bolted 7" from the top. A 68" length of 1½" pipe is bolted securely to the end supports at the top, using a short length of angle bracket to make the joint stiffer. If welding equipment is available, this joint may be welded.

Sheet metal 40"x68" is used for the top. Crossbars are bolted to each end and to the center of the pipe, to act as supports for the top. Wood strips bolted across the ends of the crossbars complete the framework. The metal or galvanized tin top is nailed to the wood strips and bent over the crossbars.

Cross pipe at top must be bolted or welded to triangular end supports.


TIN TOP BOLTS TO FRAME
WOOD STRIPS BOLTED TO ANGLE IRON TOP SUPPORTS
40"
SEE DETAIL (B) FOR THIS ASSEMBLY
WOOD STRIP
1½" X 68" PIPE
1½" X 40" ANGLE IRON
OILCLOTH TRIM
15" BRACES
FROM BED FRAME
CROSS-PIECES OF 16" STRAP IRON BOLT 7" FROM TOP
1½" X 72" ANGLE IRON
1½" X 48" ANGLE
NOTE: SWING CABLES SHOULD BE 120" LONG

Give framework of swing 2 or 3 coats of grass green paint. Bright oilcloth adds modernistic touch.

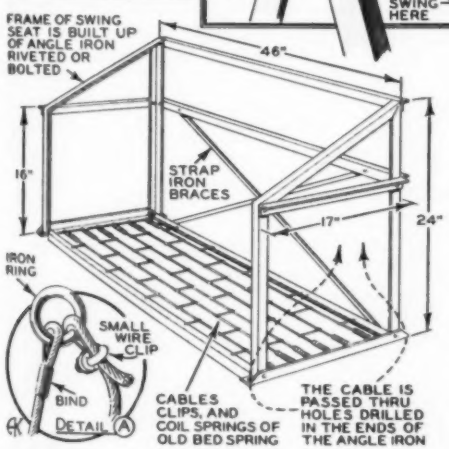


Auto cushions are fine for both bottom and back of seat.

The base of the seat is 17"x46", and the backrest 24" high. It may be built up from angle irons or from hardwood. The seat is reinforced with an old bed spring cut to the correct size. A cloth pad may be laid over this bed spring, but a more comfortable seat will be obtained if an old automobile cushion of correct size is used.

Loop two 10-ft. lengths of wire cable over hooks bolted to the iron pipe, and fasten to the seat corners.

When fully assembled, the swing should be given two or three coats of paint. For top trimming, tack brightly-colored oilcloth to the wooden framework, allowing the edges to protrude below the top about six inches.

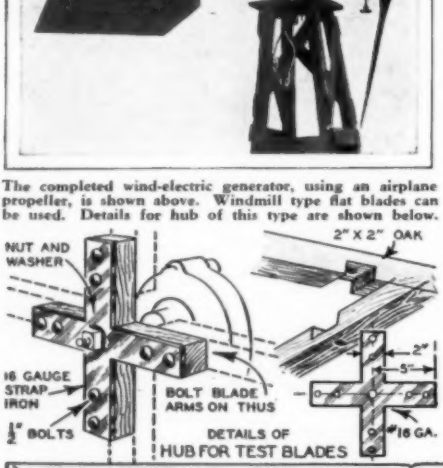

FRAME OF SWING SEAT IS BUILT UP OF ANGLE IRON RIVETED OR BOLTED
46"
16"
STRAP IRON BRACES
17"
24"
IRON RING
SMALL WIRE CLIP
BIND
DETAIL (A)
CABLES CLIPS, AND COIL SPRINGS OF OLD BED SPRING
THE CABLE IS PASSED THRU HOLES DRILLED IN THE ENDS OF THE ANGLE IRON

Swing seat may be made with angle irons or with good 1"x2" hardwood strips. Attach cushions to back and seat.

Build a WIND-ELECTRIC

by **WESTON FARMER**

The completed wind-electric generator, using an airplane propeller, is shown above. Windmill type flat blades can be used. Details for hub of this type are shown below.

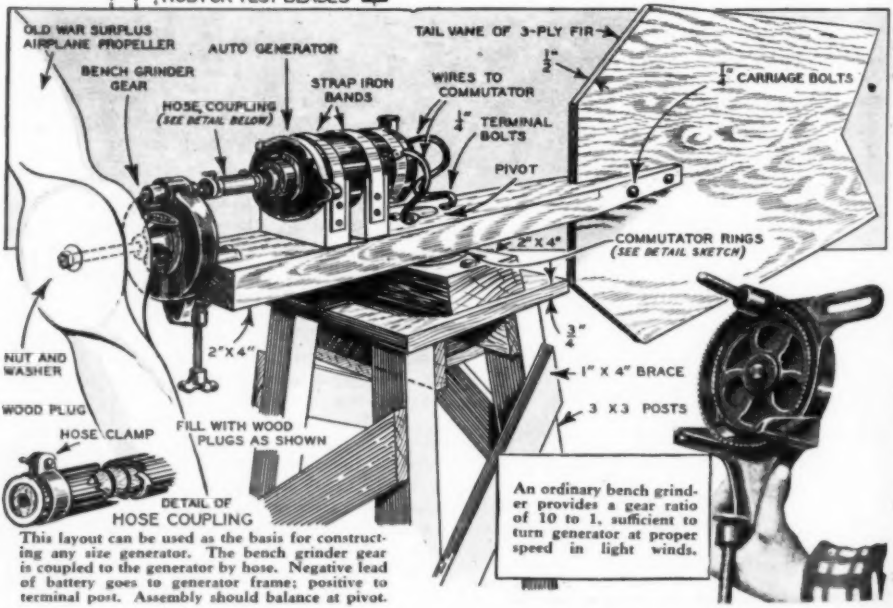


THERE are three variables encountered in designing a wind-electric generator. The wind varies in certain localities; no two dynamos or generators have the same wattage or power output or take the same power to run; and upon these two variables the size of the propeller therefore depends.

However, the generator described here can be used as a basic design, the features of which can be changed to suit local conditions. If you follow directions, you will have not only a good generator, but one that will be cheap and long lived.

Any generator takes a certain amount of power to start it whirling and to keep driving it. This is expressed in the electrical terms of wattage. Volts times amperage equals wattage; if we have a six volt generator, which is the voltage of most automobile generators, we can expect to obtain a peak of 20 amps. The highest probable output would be 120 watts. However, the automatic cutouts which come with generators are set to cut in at 2 amps or thereabout, which means that when the propeller is turning up sufficiently to give an output of two amps the generator will deliver 12 watts. This usually is at a shaft speed of about 600 r.p.m.

Warm weather will decrease the output



This layout can be used as the basis for constructing any size generator. The bench grinder gear is coupled to the generator by hose. Negative lead of battery goes to generator frame; positive to terminal post. Assembly should balance at pivot.

Generator for Home Lighting

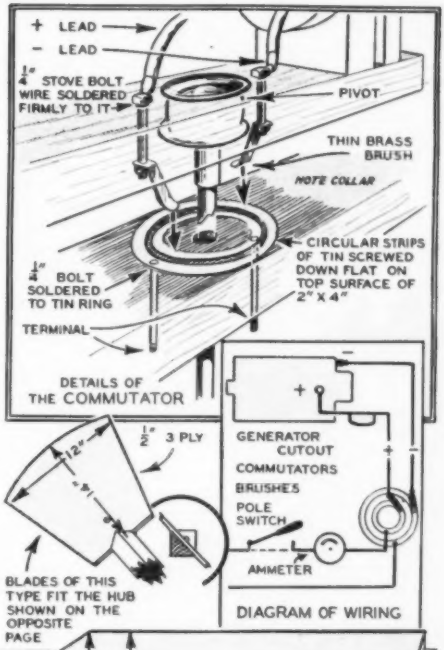
This simple wind generator can be built for a few dollars to light farm buildings. All problems of wind-electric plants are covered thoroughly by the writer.

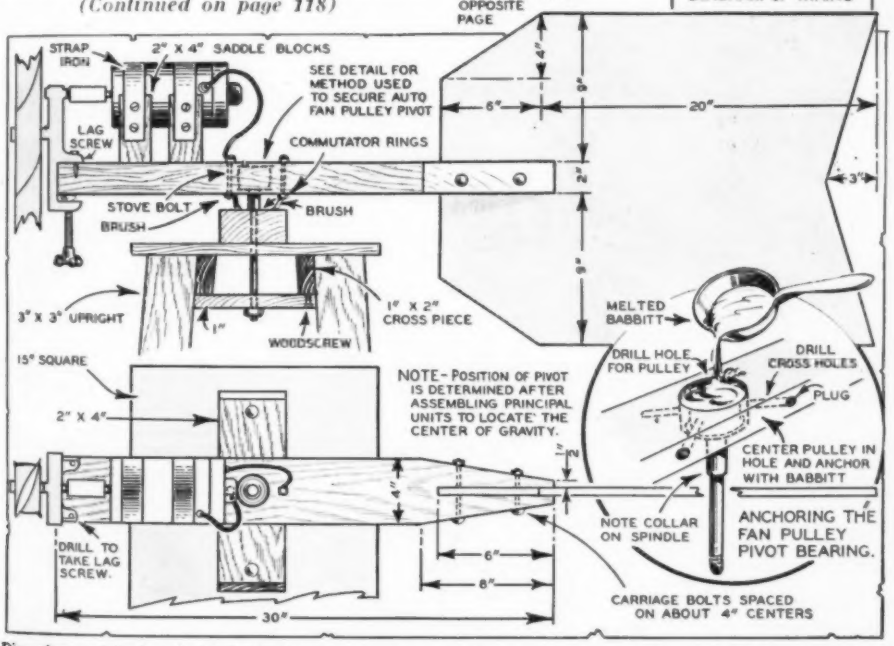
of the generator. Then too, you cannot count on more than average wind strength, so that it is fair to say that with the southwest wind of 15-25 miles, which prevails all through the plains country of the central United States, you can count on six to eight hours a day delivery of from 12 to 60 watts. This is quite sufficient to charge two average storage batteries, and as you will be using them largely for lighting purposes you can draw off current in proportion.

Wind-electric generators, unless they are large and elaborate, cannot be used to run washing machines, milking machines, or the like. Their chief value is in charging the car battery or batteries, and in furnishing a perpetual source of "juice" for summer cabin lighting or for lights about the farm.

Automobile headlight bulbs in voltage ratings corresponding to the generators and batteries can be used with this system.

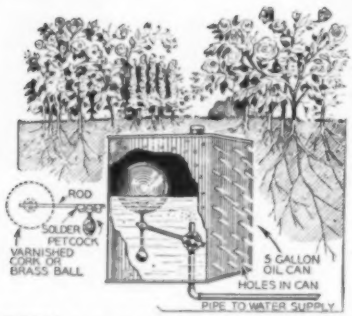
(Continued on page 118)





Dimensions and further details for building the generator are shown in the above drawing. The blades shown above at right are for the windmill type of propeller. The ammeter and pole switch should be located in battery house.

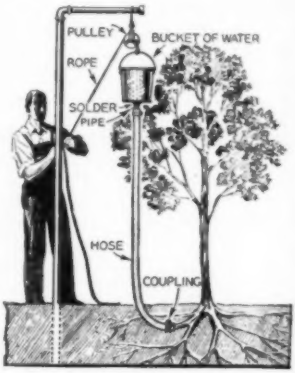
Timely Gardening Tips



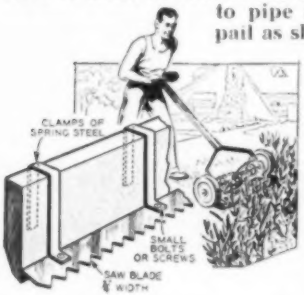
An Automatic Waterer for Flower Gardens

AN AUTOMATIC waterer for the flower garden is easily made. Punch a few holes in a 5 gallon oil can, and bury in the center of the garden. Run a water pipe in through bottom of can and attach a small valve. Solder a short lever to the handle of the valve, to which is attached a float. Hang a small lead weight to the float. Adjust so that valve is closed when tank is almost full.—E. Van Antwerp.

Forcing Water Into a Dying Fruit Tree



YOU can greatly increase chances for success in transplanting a fruit tree several years old by forcing water into the roots in this manner. Clamp a length of garden hose to a cut-off root of the tree. Run other end of hose to pipe soldered into bottom of a pail as shown.—Julia Wolfe.

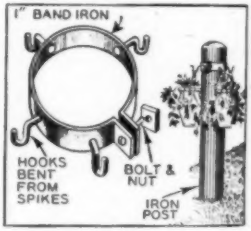


Cutting Weeds With Lawn Mower

LAWN mowers will not ordinarily cut tall weeds, tough grass, or tall dandelions. If a piece of an ordinary saw, about ¾" wide, with around eight teeth to the inch, is attached to one or more of the mower blades, there will be no further trouble from this source. The saw teeth will cut the tough material.—Carl Tobleck.

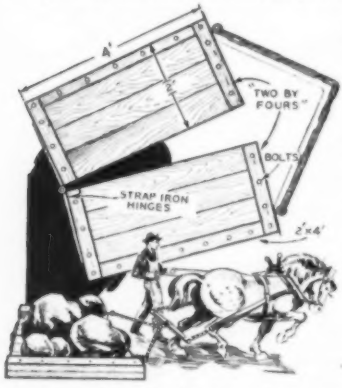
Fastening Hooks to Iron Post for Flower Pots

TO MAKE a hanger that will fit on any iron post, cut out a band of sheet metal about one inch wide and 2" longer than the circumference of the post. Drill 7/32" holes for 20 penny nails which are to be bent to form hooks. —R. M. Attwool.



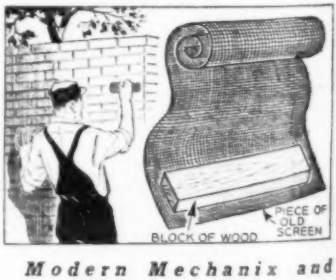
One Man Stoneboat

ONE man can, with a team of horses and this simple stoneboat, easily clear a field of rocks. Open the hinged sections of the stoneboat and "straddle" the rock. The team will pull them together, thus loading the rock.—Roy W. Pugh.



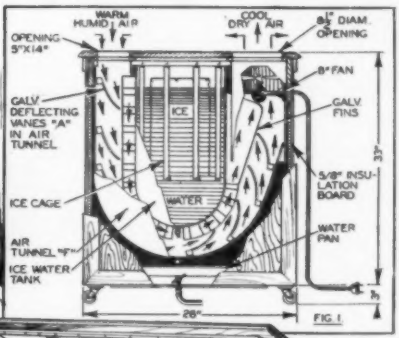
Old Screen Wire Makes Good Brush

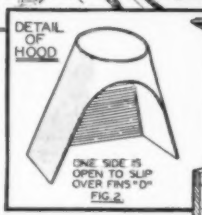
AN excellent brush for cleaning brick walls, scraping carbon on autos, or any rough cleaning work can be made from old screen wire. Wrap eight or ten turns of screening tightly around a block of wood of any convenient size, allowing the wire to extend one inch over at each end.—Earl Thomas.



Portable Room Cooler Supplies ICED Air

Party guests will appreciate this easily-made room air conditioner on those sultry summer evenings. Ice is the cooling agent.

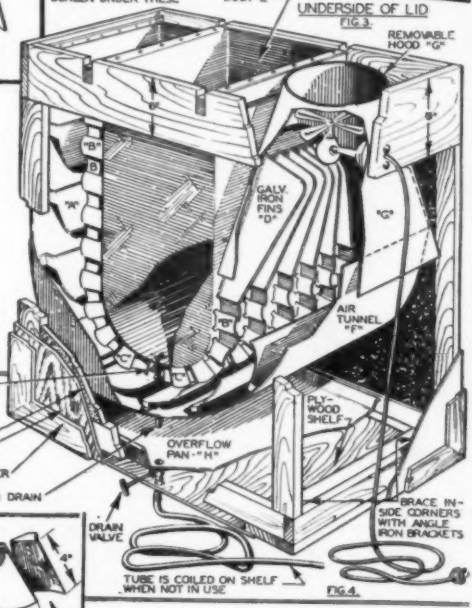


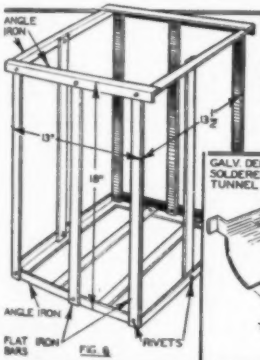


WHEN the temperature is hovering around 95 in the shade —when the air is damp and sultry—then your dinner or party guests will really appreciate this efficient little room air conditioner. The unit is really simple if built according to these plans. It draws warm air from the room over ice-chilled copper vanes, delivering cool dry air which relieves the oppressive humidity and appreciably cools the room.

The drawings show clearly just how the air conditioner is constructed. Almost any design can be used as long as it provides sufficient cooling surface. In this unit there are nearly 2000 sq. in. of cooling surface. The unit is mounted on casters, and so can be moved to any room where there is an electric outlet for the fan. It is pushed to the back porch, where ice is packed in and water drained off.

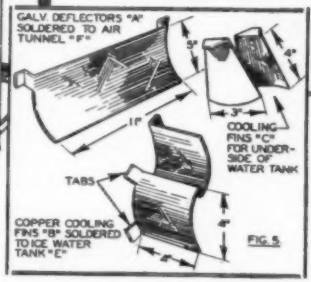
The room to be cooled should be closed off and the fan started. Cold water is poured over the ice until the water level reaches the bottom of the ice cage.





DETAIL OF ICE TANK CAGE

USE ONE INCH BY ONE EIGHTH ANGLE IRONS AND BARS



Metal cage of angle irons is needed inside ice tank to prevent damage when large pieces of ice are dropped in. Copper cooling fins, soldered to ice tank, are good heat conductors, and cool air faster. Galvanized tin deflectors direct air back to copper fins. Insulating board is nailed to inside of plywood panels, to prevent moisture from condensing on outside of unit. Nail fine mesh screen over each opening at top, to keep dirt out. Remove top to fill with ice.

Build This Coffee Table In

by OSCAR E. OLSON

THIS coffee table will lend a touch of Colonial America to your home. The recognized popularity of this article of furniture makes it a desirable piece of work for the home craftsman, and offers opportunity for a display of excellent workmanship.

The top is constructed of ⅜" black walnut or other good furniture stock. It is bordered by a side rail of ¾" material.

The twelve top sections (Fig. 8) should be at least 12½" long, to allow for trim after gluing. Groups of three pieces can be glued together at once, and the sections then assembled and glued. Sandpaper this part of the top completely before beginning the side rail.

This rail is cut as one long piece, an inlay design being worked in if desired. The individual pieces are then cut out. Construct a jig to accurately locate the dowel holes in each piece. (Fig. 6.)

Double Top Needed

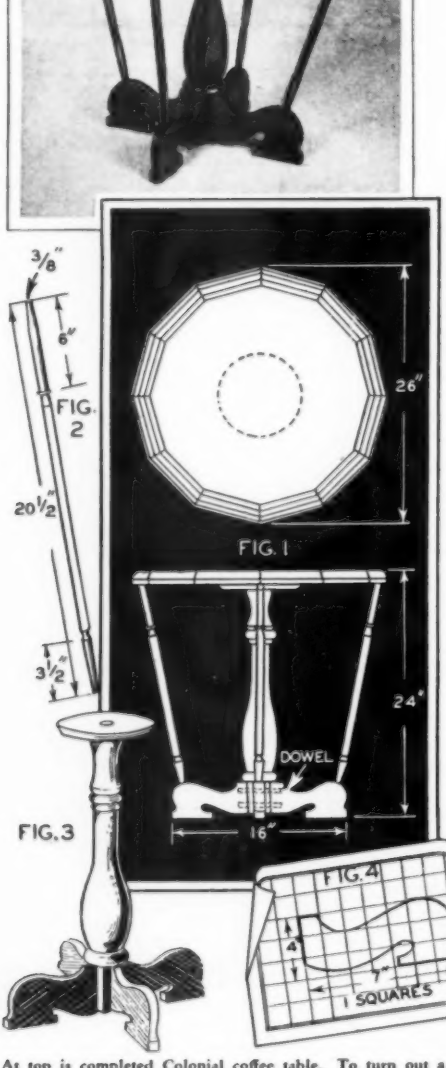
A re-enforcement plate to be glued and screwed to the under side of the table top is cut from ¾" stock and dressed down on the lathe. Screw holes should be located to hit the center of each top section. This wood plate provides a solid union for the center post, and eliminates any possibility of the top warping. (Fig. 5.)

The center post is turned out of a piece of 4"x4"x24" stock. If such a piece is not available it can be built up from matched wood of smaller dimensions. Much of the beauty of turning lies in well rounded curves and clean, smooth cuts. (Fig. 3.)

The dowel holes for the feet are bored entirely through the square section at the bottom of the center post.

The spindle braces, four in number, are turned out of 1"x1"x22" stock. Care should be taken to bring the ends exactly to ⅜" diameter. (Fig. 2.)

All the feet can be cut in one operation. Pile up four boards of ¾" stock and nail together, being sure the brads are in waste



At top is completed Colonial coffee table. To turn out a really distinctive table, use the best wood obtainable and take especial care in sanding and applying the final finishes. Black walnut, mahogany, or possibly gumwood may be used.

Colonial Design

stock. Make a pattern out of stiff paper, tack to the top board, and saw all boards at once on the bandsaw. Be sure the dowel holes in the feet match up perfectly with those of the turned post base.

Glue two opposite feet to the turned post, making sure they are well clamped in position. When the glue has set, repeat with the remaining two feet.

Fit the turned center post into the hole drilled in the top reinforcing board. Run a string from the frame around the top to the high part of the curve on one of the feet. Mark on both side rail and leg the angle at which holes must be bored, repeating the process for each foot.

Glue the top of the table to the turned post and the spindles, and glue the spindles into the foot holes. Should there be a tendency for the corners to shift out of position, apply pressure by placing weights on the table top. After allowing twenty-four hours for the glue to set, retouch with sandpaper and steel wool.

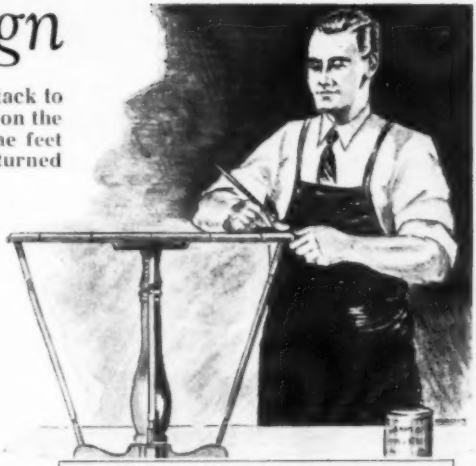
Finishing the Table

Rub the sanded table with boiled linseed oil and let stand for twelve hours. This oil gives a color tone of age to the wood.

If the table has been made of light wood, a stain is advisable. If of dark wood, such as black walnut, then the natural color will appear best.

A thin coat of shellac brushed on evenly brings out the grain and serves as an excellent base for wax and varnish.

If a wax finish is desired, rub on two coats of furniture wax and polish to a rich luster. For a varnish finish use a high grade of furniture varnish, brushing it on evenly.



The coffee table is just large enough for light lunches for that bridge foursome. The entire project can be turned out with ordinary wood-working shop tools such as turning lathe, band saw, and circular saw. All joints are glued together, using dowels for reinforcement. Bottom end of center post is square.

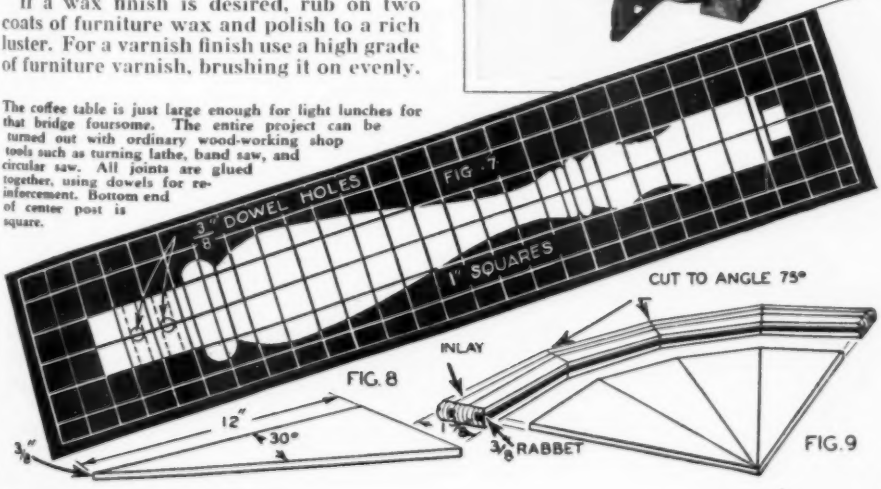


FIG. 8

FIG. 9

Money Saving Ideas for Autoists

Here's how to tell the polarity of a battery, to make worn starter bearings as good as new, to get extra miles out of tires, to cut down the number of punctures, to use old tires on trailers, and to make a trailer hitch that's absolutely safe.

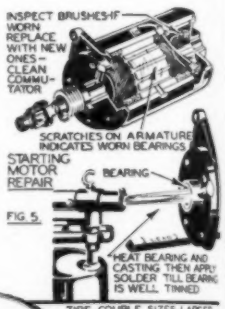
HOW TO DETERMINE POSITIVE POST ON BATTERY
NEGATIVE POST HAS WHITE CORROSION IF ANY
FIG. 1
IF BATTERY IS BEING PUT INTO CAR, CONNECT TEMPORARILY AND TURN ON LIGHTS. LOOK AT AMMETER. IF IT REGISTERS DISCHARGE IT IS CONNECTED PROPERLY
POSITIVE POST USUALLY HAS A COATING OF GREENISH CORROSION

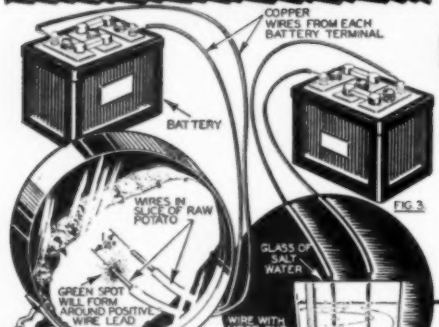
BEARINGS

are probably worn when your starting motor loses its pep, seems to growl its way around.

To make a simple repair, clean each bearing with gasoline, and then with soldering paste. With a blow torch carefully bring the temperature of the casting to the point where bearing will melt solder.

Apply solder until bearing is well tinned, and starter is good as new.

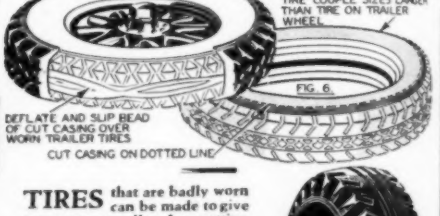

INSPECT BRUSHES. IF WORN REPLACE WITH NEW ONES—CLEAN COMMUTATOR
SCRATCHES ON ARMATURE INDICATES WORN BEARINGS
STARTING MOTOR REPAIR
BEARING
FIG. 5
HEAT BEARING AND CASTING THEN APPLY SOLDER TILL BEARING IS WELL TINNED


COPPER WIRES FROM EACH BATTERY TERMINAL
BATTERY
WIRES IN SLICE OF RAW POTATO
GREEN SPOT WILL FORM AROUND POSITIVE WIRE LEAD
FIG. 2
GLASS OF SALT WATER
WIRE WITH MOST BUBBLES ON IS NEGATIVE LEAD
FIG. 3

BATTERY POLARITY

can be determined in a number of ways. Where battery is in car, it is connected properly if ammeter shows discharge when lights are on. Positive post usually has a coating of greenish corrosion; negative post has white corrosion if any.

Negative ends of lead connector straps become more discolored with age. Potato and salt water tests shown above are easy to make, and give positive indications.


TIRE COUPLE SIZES LARGER THAN TIRE ON TRAILER WHEEL
FIG. 6
DEFLATE AND SLIP BEAD OF CUT CASING OVER WORN TRAILER TIRES
CUT CASING ON DOTTED LINE

TIRES

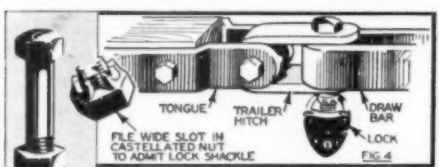
that are badly worn can be made to give many more miles by putting them inside another old casing. Cut beads off tire a few sizes larger than the one on the car, and slip over deflated tire.

TUBES

will not last long where tire casing is badly cut or bruised. If casing is worth repairing, clean inside with gasoline and apply several coats of rubber cement.

Clean a good inner tube in same manner and apply cement. Carefully place tube in casing and inflate as much as possible.

When cement dries, trim tube down to rim of tire, insert a good inner tube; mount tire.



TRAILER HITCH

bolts sometimes fall out, if put in carelessly, and accidents result.

Get a steel machine bolt ½" in diameter and 2" long, with castellated nut. Drill a 3/16" hole near thread end of bolt, and countersink so that shackle of small padlock will slide through easily.

With this padlock there is no danger of the trailer coming loose.

PUNCTURES

have been found to occur more frequently in rear tires of autos, because front tires kick nails up. Splash guards mounted behind front wheels will bounce nails back, protecting rear tires.

Ride the Waves on This Steering Aquaplane Board

THE thrills of aquaplaning, that most zestful of water sports, are greatly increased by attaching a simple controllable rudder to the bottom of the board.

This rudder, when controlled by the hand lines, will cause the board to careen thrillingly from side to side. It lessens the number of spills, too. The rider, falling to one side, pulls the opposite line to automatically regain balance as the board swerves under him.

Be sure to use screws in fastening the boards together. At speeds of 35 m.p.h. the strain imposed on the board by the water is surprising.

Although many consider aquaplaning a very difficult sport, riding this board is really quite simple. It will take but a short time for the rider to learn many graceful and interesting maneuvers.

Screweyes and a large nail are used to hinge the rudder to its support. Rope or cable is run through screweyes to the hand line.

Steering aquaplane is easily made; provides many thrills.

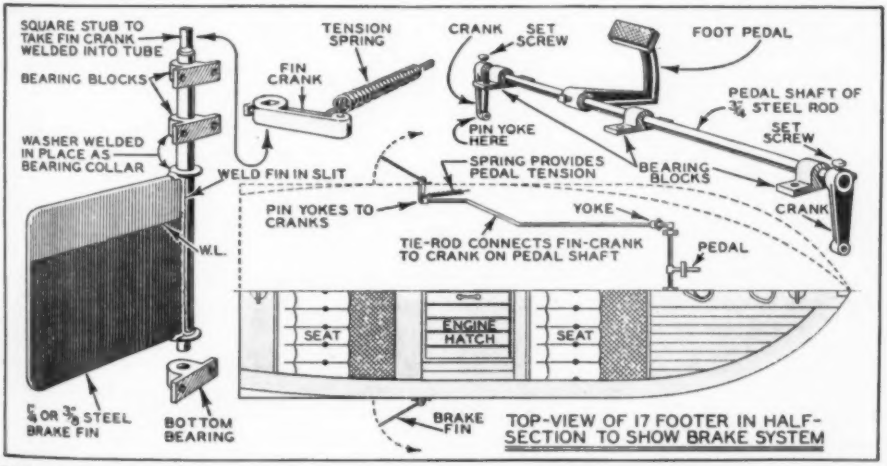
Water Brakes for Your Speed Boat

BRAKES are often badly needed on the faster speed boats in avoiding a crash or in slowing up for a landing. The system described here is adaptable to any boat.

Steel plates of ¼" to ¾" material welded to a hinged section of steel tubing serve as brakes. A lever arrangement connects these fins to a foot pedal near the control seat, so that pressure on the pedal forces the fins out at right angles to the boat.

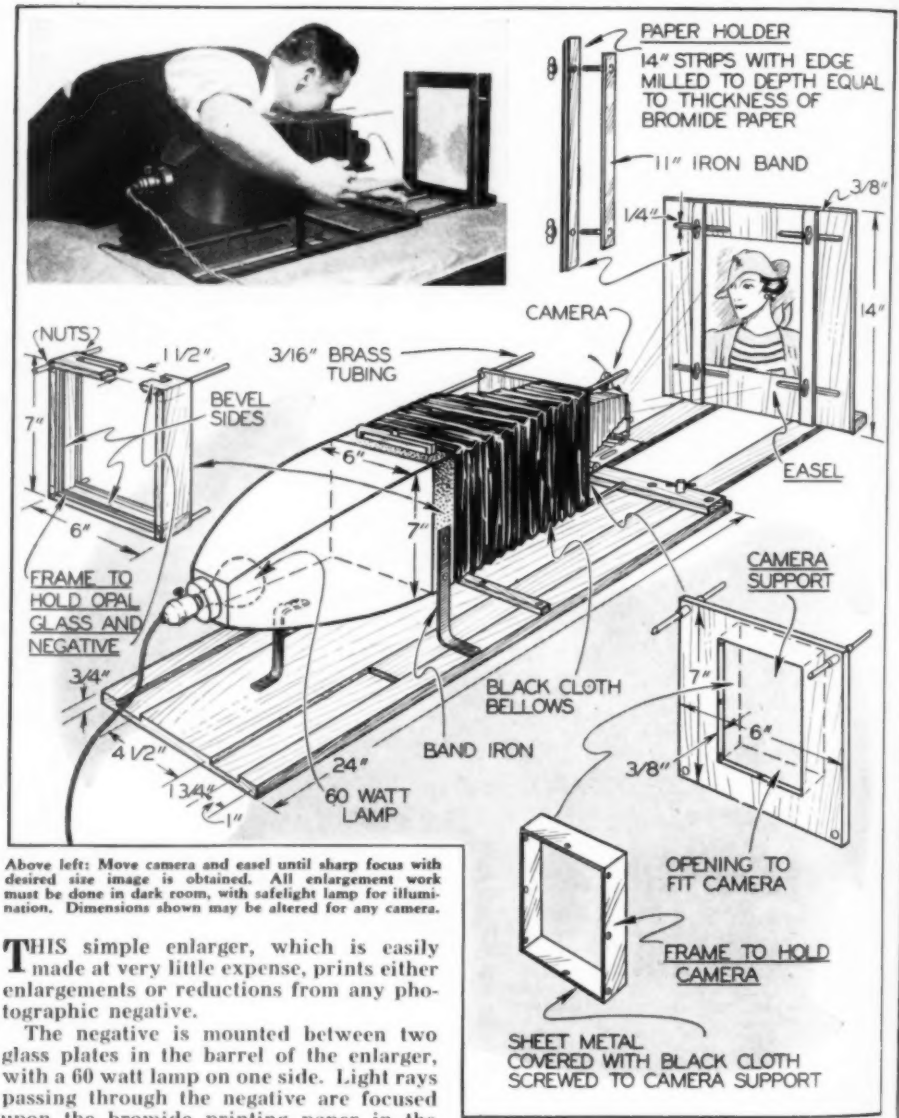
For a 17 foot boat fins measuring 9"x14" below the waterline, with 4 inches projecting above, will be about right.

The tension springs should be only heavy enough to keep the pedal up, since the motion of the boat itself will keep the fins folded back against the sides of the hull.



Weld steel fin plate into slot in steel tube. Water exerts terrific force on brake, so all parts of system must be strong.

Use Your Camera to Enlarge Negatives



Above left: Move camera and easel until sharp focus with desired size image is obtained. All enlargement work must be done in dark room, with safelight lamp for illumination. Dimensions shown may be altered for any camera.

THIS simple enlarger, which is easily made at very little expense, prints either enlargements or reductions from any photographic negative.

The negative is mounted between two glass plates in the barrel of the enlarger, with a 60 watt lamp on one side. Light rays passing through the negative are focused upon the bromide printing paper in the easel by an ordinary camera. Of course, the process must be carried out in a dark room.

The frame for holding negatives should fit the largest size negative to be used; for smaller negatives a paper mask is cut out to prevent light passing around the film from fogging the bromide paper.

Grooves are cut to hold the two clear glass plates. The edges are rabbeted on the side facing the bulb to take a sheet of opal glass used to give a diffused light.

The camera support is made of ¾ inch plywood, the dimensions of course depending upon the camera being used. One inch lengths of brass tubing at the corners of the frame act as bushings for the 3/16" brass rod or tubing supporting the camera frame.

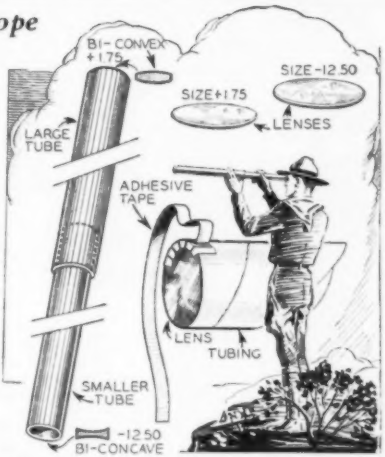
(Continued on page 120)

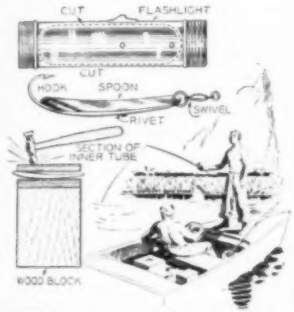
Vacation Camping Ideas

Eye Glass Lenses Make Powerful Telescope

A POWERFUL telescope with a magnifying power of around 25 can easily be made for a few cents. Select two cardboard mailing tubes around two inches in diameter and twenty-two inches long, which will slide into each other with a fairly tight fit. Mount a —12.50 lens at the end of the small tube, and a +1.75 lens at the end furthest from the eyes.

Paper, paste, and adhesive tape will do for the lens mounting, if a metal frame is not available. Waterproof the tube inside and out with several coats of shellac or enamel. To focus on distant objects merely slide the tubes in and out.—B. Ruthenberg.



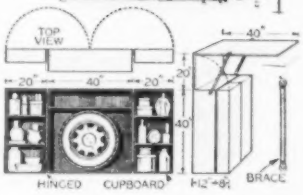


Trolling Spoon Made From a Flashlight Case

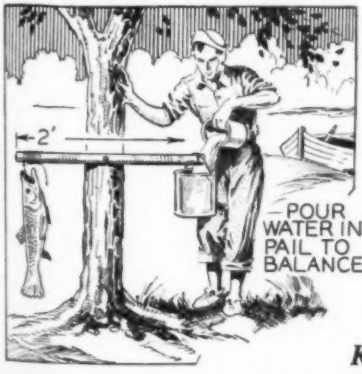
AN excellent trolling spoon is easily made from the nickel plated case of a discarded flashlight. Cut spoon to shape with tin snips, place between two sections of inner tube or auto tire casing on a wood block, and pound to shape with ball pein hammer. Attach hooks and leader, polish nickel surface, and paint inside white.—John V. Davis.

Camping Trunk for Auto

THIS roomy auto trunk and awning should find favor with those tourists who prefer to spend the night in a tourist cabin. The arrangement is ideal for the noon-day lunch, since so little time is needed to set it up. Make the trunk as large as possible, and high enough to even intrude a bit on the rear window. Spare tire is inside the trunk. The door is hinged at top back, and swings upward to form part of awning.—J. A. Mountfort.

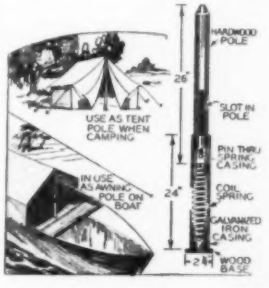


Weighing Fish at the Camp



WHEN you catch a "big boy" up in the North Woods, and haven't a scale in your kit, just rig up an equal arm balance on the nearest tree, and find out how many cups of water will balance your fish. Weigh the water and the pail later, when you get a scale, using the same cup for measuring.—O. Sprungman.

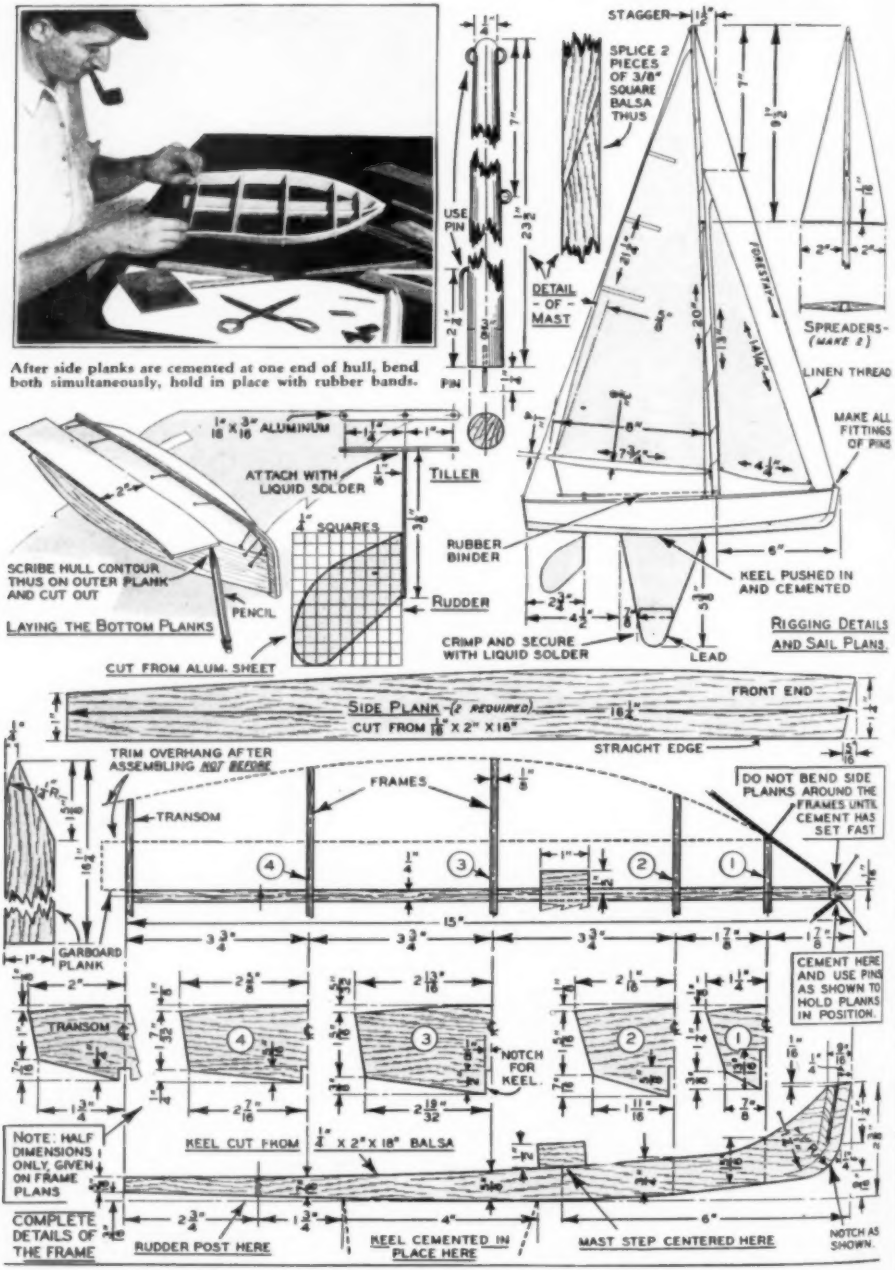
Spring Tent Pole Keeps Canvas Tight



CANVAS awnings and tents generally shrink when damp, with the result that ropes are loosened, and the tent sags in dry weather. This extensible pole has a spring built into itself, to take up the play due to weather changes, and keep the canvas always tight.—A. W. Rice.

Build "Victory"—World's Lightest

After side planks are cemented at one end of hull, bend both simultaneously, hold in place with rubber bands.


STAGGER
SPLICE 2 PIECES OF 3/8" SQUARE BALSA THUS
USE PIN
DETAIL - OF - MAST
PIN
SPREADERS (MAKE 2)
LINEN THREAD
MAKE ALL FITTINGS OF PINS
FORESTAY
1" X 3/16" ALUMINUM
ATTACH WITH LIQUID SOLDER
TILLER
RUBBER BINDER
KEEL PUSHED IN AND CEMENTED
SQUARES
SCRIBE HULL CONTOUR THUS ON OUTER PLANK AND CUT OUT
PENCIL
RUDDER
LAYING THE BOTTOM PLANKS
CUT FROM ALUM. SHEET
CRIMP AND SECURE WITH LIQUID SOLDER
LEAD
RIGGING DETAILS AND SAIL PLANS
FRONT END
SIDE PLANK (2 REQUIRED) CUT FROM 1/16" X 2" X 18"
STRAIGHT EDGE
TRIM OVERHANG AFTER ASSEMBLING NOT BEFORE
FRAMES
TRANSOM
DO NOT BEND SIDE PLANKS AROUND THE FRAMES UNTIL CEMENT HAS SET FAST
GARBOARD PLANK
CEMENT HERE AND USE PINS AS SHOWN TO HOLD PLANKS IN POSITION.
NOTCH FOR KEEL
NOTE: HALF DIMENSIONS ONLY GIVEN ON FRAME PLANS
KEEL CUT FROM 1/4" X 2" X 18" BALSA
COMPLETE DETAILS OF THE FRAME
RUDDER POST HERE
KEEL CEMENTED IN PLACE HERE
MAST STEP CENTERED HERE
NOTCH AS SHOWN.

Constructional details of "Victory," showing half-breadth plans for frames. Use great care in plotting and cutting frame members from balsa, for they determine shape of finished boat. Sail plans and rigging dimensions are shown above.

and FASTEST SAILING MODEL

by J. JULIUS FANTA

THE model yacht *Victory*, the newest departure in midget sailing models, is twice as fast as the solid hulls which have hitherto been used. If you want a winning boat, here it is!

Because the craft is so light, the entire freeboard rides above water when on an even keel. There is no excess weight to weigh the hull down into the water and increase sailing resistance. Although the balsa wood construction is light, the boat is sufficiently strong to endure rough handling, and will not capsize in a heavy blow. It will point into the wind in heavy-going, since it carries a balanced rig, with sail effort stabilized with center of weight.

Balsa wood, which should be used throughout, can be cut nicely with a single-edged razor blade. Household shears and stick pins serve as your only tools. Sounds easy enough, doesn't it?

Use Balsa Wood for Keel

All joints are cemented. It is suggested that model airplane cement be used. Allow at least 30 minutes for all cement processes to dry.

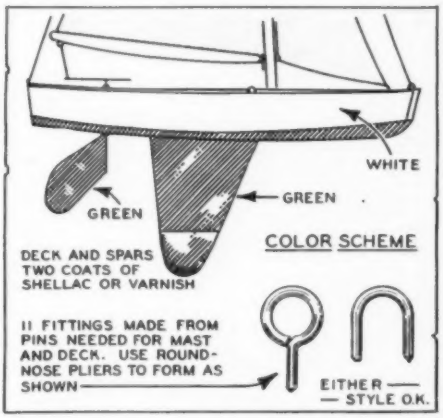
Now let's get under way for about three fascinating hours of building *Victory*. Have your balsa milled and dressed into eight strips 1/16"x2"x18" for planking and two pieces ⅛"x2"x18" for frames.

Lay out the keel on a balsa strip ¼"x-2"x18", and cut according to diagram, with proper offsets.

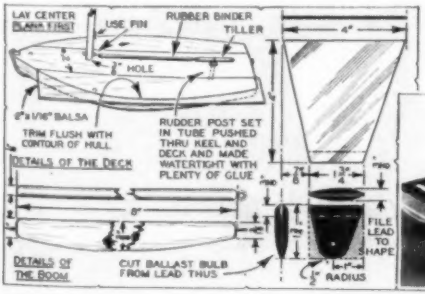
On the ⅛" balsa, mark and number the frames as stipulated in drawing. Notch each as designated so that all frames fit tightly over top of keel. Make sure the frames are at right angles to the keel perpendicularly and horizontally. Apply small amount of cement at point where

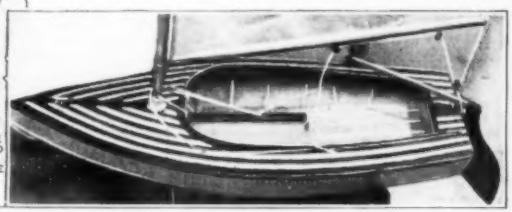
(Continued on page 124)

"Victory" tips the scales at 9¼ ounces, though she is all of 15 inches long. For mantel mounting this small cradle can be cut out of balsa, and a shorter keel fin used.


WHITE
GREEN
GREEN
COLOR SCHEME
DECK AND SPARS TWO COATS OF SHELLAC OR VARNISH
11 FITTINGS MADE FROM PINS NEEDED FOR MAST AND DECK. USE ROUND-NOSE PLIERS TO FORM AS SHOWN
EITHER — STYLE O.K.

Suggested color arrangement, with details of rigging and spar fittings. Be sure to apply two coats of paint before placing hull in water, as balsa is absorbent when unpainted.

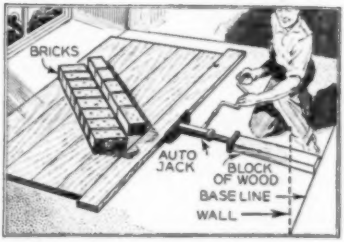

LAY CENTER BLANK FIRST
USE PIN
RUBBER BINDER
TILLER
4"
⅛" HOLE
6" x 1/16" BALSA
TRIM FLUSH WITH CONTOUR OF HULL
RUDDER POST SET IN TUBE PUSHED THRU KEEL AND DECK AND MADE WATERTIGHT WITH PLENTY OF GLUE
DETAILS OF THE DECK
FILE LEAD TO SHAPE
DETAILS OF THE BOOM
CUT BALLAST BULB FROM LEAD THUS
RADIUS



Lead stabilizing bulb is cut and filed to shape to fit on tip of aluminum keel. Boom details are also shown here. At right is mantel model of "Victory," with open cockpit. Deck is planked alternatingly with ¼" strips of mahogany and pine.

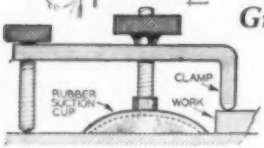
Ideas for the Workshop Fan

A Simple Press for Gluing Large Planks



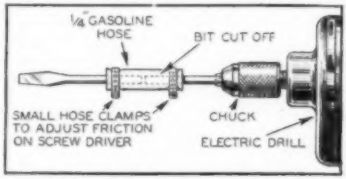
WHEN a number of large planks are to be glued, lay them out on the floor against one wall. Run a board crosswise to opposite wall, using a length which will leave room for an auto jack. Apply glue, and tighten the jack. Place weights on boards to prevent buckling.—M. G. Winterton.

Handy Suction Clamp Grips Smooth Surfaces

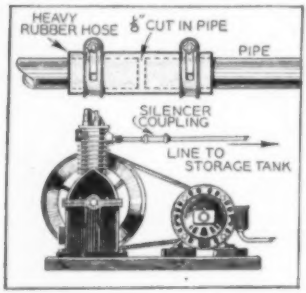


ORDINARY rubber suction cups such as are used for windshield appliances on autos can be used to make handy little clamps which grip any smooth surface. With thumbnuts loose, press suction cup to bed of machine. Tighten knobs until clamp holds work rigidly.—S. Somas.

Electric Drill Makes Power Screwdriver



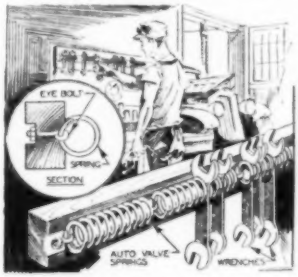
ANY electric drill can be used as a variable speed power screwdriver. Get a screwdriver blade that will fit snugly in a piece of heavy rubber air hose. Fit a steel rod of same diameter into drill chuck and other end of hose. Increase friction by tightening clamp.—W. C. Tatina.



Quieting Pressure Pump on Water System

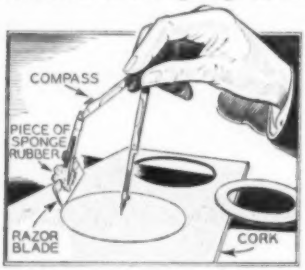
MOST of the noise coming from a basement air compressor is transmitted and amplified by the pipes running to and from the unit. This can be almost entirely eliminated by cutting out a section of each pipe, and bridging the gap with a length of rubber hose. A gap of around ¼" will do; use hose clamps to prevent any possible leakage. The improvement will be surprising.—C. W. Reynolds.

Handy Tool Rack From Valve Springs



OLD automobile valve springs fastened to the back of your workbench make very handy holders for narrow tools. Countersink holes for the eye bolts and the nuts, insert ends of the springs in the eyes.—J. N. Polivka.

Cut Gaskets Easily With an Old Razor Blade

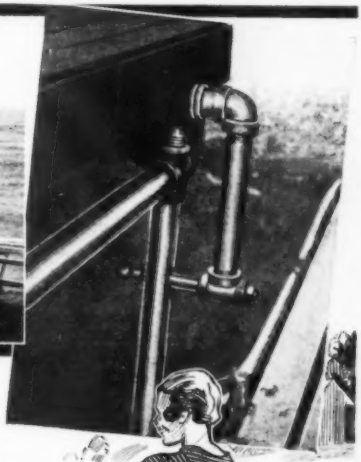


PERFECT circular gaskets of almost any diameter may be cut with ease from paper or cork, using this combination of razor blade and drawing compass. Insert the blade between the nibs of the ruling pen, using rubber pads to prevent damage to tips.—J. T. Berge.

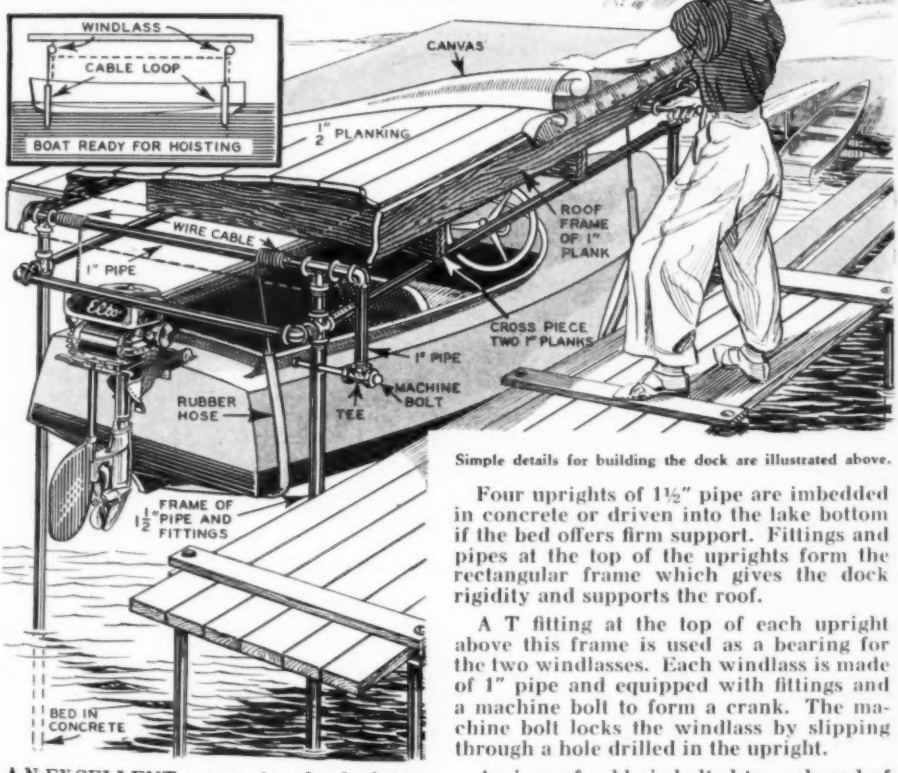
Pistons Make Ash Trays

EITHER aluminum or cast iron automobile pistons can be easily converted into really attractive ash trays. Cut the piston with a hacksaw right through the center of the wrist pin hole. Smooth with a file, polish with fine steel wool, and the job is done. Paste felt to bottom.—F. H. Monson.

Build a Suspension Drydock for Your Boat



Above—The completed drydock, showing the boat suspended by cables and protected from weather. Right—A closeup showing corner details of the upright and frame and the method of locking the windlass crank with a machine bolt that slips into a hole in the upright.



Simple details for building the dock are illustrated above.

AN EXCELLENT suspension drydock can be built with pipe and fittings. The boat is raised clear of the water by means of windlasses and a canvas covered top on the drydock protects the boat from the weather.

Four uprights of 1½" pipe are imbedded in concrete or driven into the lake bottom if the bed offers firm support. Fittings and pipes at the top of the uprights form the rectangular frame which gives the dock rigidity and supports the roof.

A T fitting at the top of each upright above this frame is used as a bearing for the two windlasses. Each windlass is made of 1" pipe and equipped with fittings and a machine bolt to form a crank. The machine bolt locks the windlass by slipping through a hole drilled in the upright.

A piece of cable is bolted to each end of the windlass shaft, forming a loop to support the boat. A piece of rubber hose slipped over the cable will protect the boat from being marred by the cable.

HAMMER and ETCH this

by **R. M. ATTWOOL**

You'll enjoy hammering these useful articles from soft copper, and etching in this striking, distinguished ship design.

Etching designs on the finished copper articles. The design is painted on with acid resisting paint, and the copper immersed in diluted nitric acid. Designs will be in relief.

WORKING in soft copper is fascinating work. The metal is so soft, so pure in color and texture, and so attractive in the finished article. An infinite variety of useful articles can be hammered or cut out of sheet copper; just as wide a variety of designs can be etched in by a simple process.

A copper desk set will prove useful in any home. It should include a set of book ends, stationery holder, letter opener, and blotter pad corners.

The book ends are cut out of 18 gauge or heavier sheet copper. Ordinary tin shears will do for cutting the rough outline; files and emery cloth should be used to smooth down any rough edges.

Protect Copper in Vise

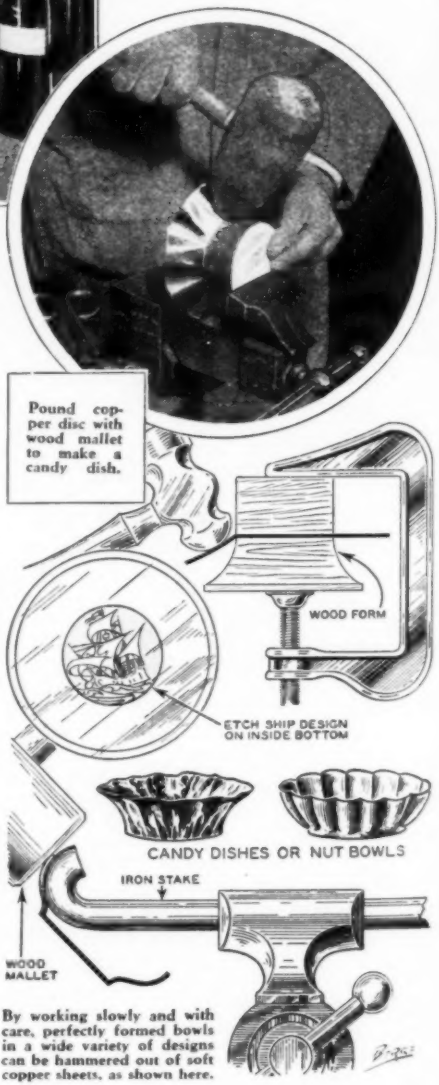
When filing copper parts held in a vise, remember always to protect the copper with pieces of wood or soft metal between the sheet material and the vise jaws.

Letter openers can be made in almost any design, provided they are not over 1"x7½" in size. They should also be cut from 18-gauge copper. A design can be hammered or etched on the handle.

Blotter pad corners can be made from thinner material, such as 22 or 24-gauge copper. The four corners can be cut from two 5-inch square pieces. The edges are bent around a piece of ¼" strap iron. The corners can be glued to the cardboard pad, or held in place with adhesive tape.

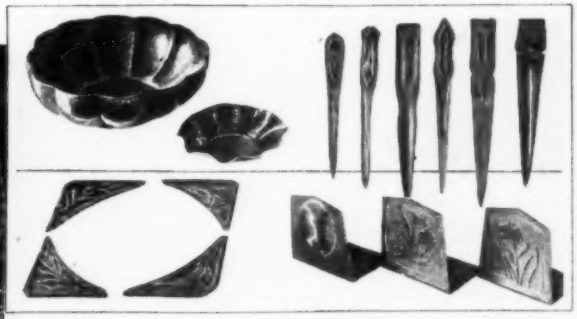
The stationery holder is cut out of a single sheet of copper 5"x11", using about 18-gauge material.

The attractiveness of the desk set is

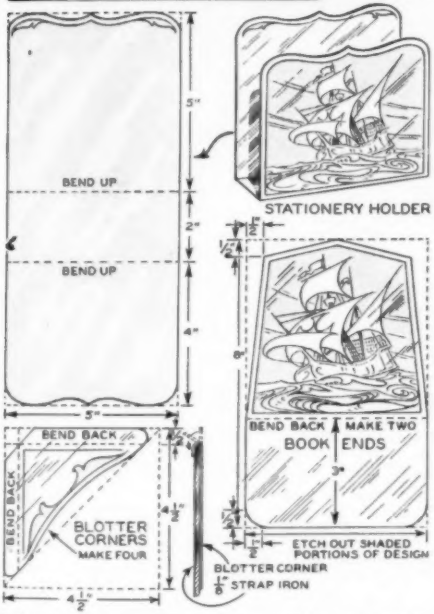

Pound copper disc with wood mallet to make a candy dish.
WOOD FORM
ETCH SHIP DESIGN ON INSIDE BOTTOM
CANDY DISHES OR NUT BOWLS
IRON STAKE
WOOD MALLET

By working slowly and with care, perfectly formed bowls in a wide variety of designs can be hammered out of soft copper sheets, as shown here.

DESK SET in Soft Copper



Pictured above are just a few of the many useful articles which may be made with soft copper. Articles may be lacquered to preserve original shiny finish.



Enlarge design to correct size for each article, and transfer.

greatly increased by etching the same design on each piece. The design appears in relief, the background being eaten away with nitric acid.

First clean off the copper with steel wool or fine emery cloth. Draw or trace on the designs lightly with pencil. Paint parts which are to be in relief with acid resisting material such as asphaltum varnish. Remember that the finished etching will look no better than the painting. Allow two hours or more for the varnish to dry. If the asphaltum varnish is too thick it may be thinned with turpentine.

Either asphaltum or a mixture of equal parts of paraffin and beeswax may be painted on the backs and edges of the articles. Be sure to use a double boiler when melting the wax. Heat the copper until it can just be held in the hands. Apply the wax quickly with a large brush and allow to cool for ten minutes.

If the acid is eating the copper too fast, dilute with more water. From two to four hours is about the correct time.

Rinse Off All Acid

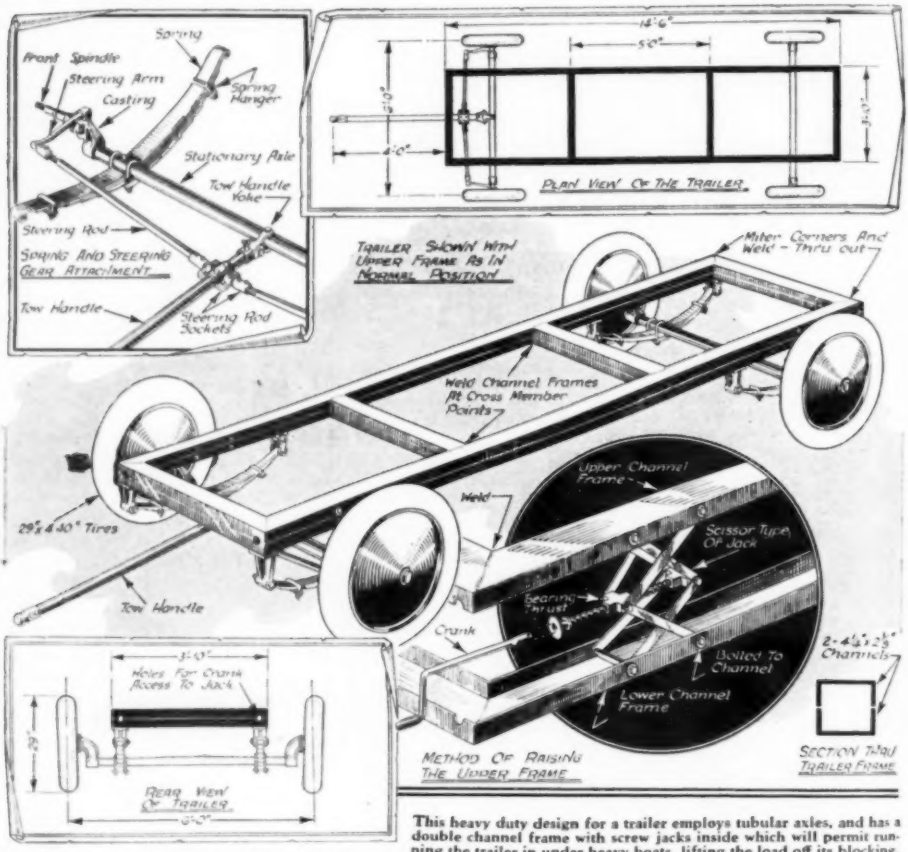
When the desired depth has been obtained, rinse well in water and remove asphaltum and wax with kerosene or turpentine.

The copper may be given any color from a beautiful light brown to a rich black by treating with liver of sulphur solution. Dissolve a piece about the size of a pea in a cup of hot water. Warm the copper in hot water and brush on the solution. Lighter tones are obtained by adding more water to the sulphur solution. Allow to dry without rubbing, coat with any floor wax, and polish with a soft cloth.

Candy dishes or nut bowls offer an excellent opportunity for interesting hammered copper work. First draw a cross section view of the desired dish. Measure around this full size view to determine the size of the circular piece of metal needed.

Make two circular forms from three-inch hard wood. Place the copper disk between these two forms and clamp in a vise. Pound the copper down lightly over the wood form with a ball pein hammer. Work from the center outward, always pounding on wrinkles and moving around the piece. If the copper becomes too hard it may be softened by bringing to a red heat and cooling.

Heavy Duty TRAILER is Self-Loading



This heavy duty design for a trailer employs tubular axles, and has a double channel frame with screw jacks inside which will permit running the trailer in under heavy boats, lifting the load off its blocking, and allowing it to be lowered to the trailer frame. The same idea could be employed with heavy loaded bodies or racks.

by **E. D. HILBURN**

MANY M-M readers have requested plans for a simple heavy duty trailer that they could build themselves. Here it is. One like it has worked to perfection.

With it you can trundle heavy 30 foot boats to the waterside for launching, or you can use it about the farm for picking up rack or side bodies, thus making a wagon of it.

The central idea lies in using a double channel frame with screw jacks in each corner. A frame rise of about 10 to 12 inches is thus gained.

Suppose you have a boat about to be loaded. You shift the weight off the keel blocks and put cross timber under her. Then you run the trailer in, and instead of letting the boat down a grunt at a time, you run up the frame of the trailer, take the load off the cross beams, and lower the boat after the blocking has been pulled out.

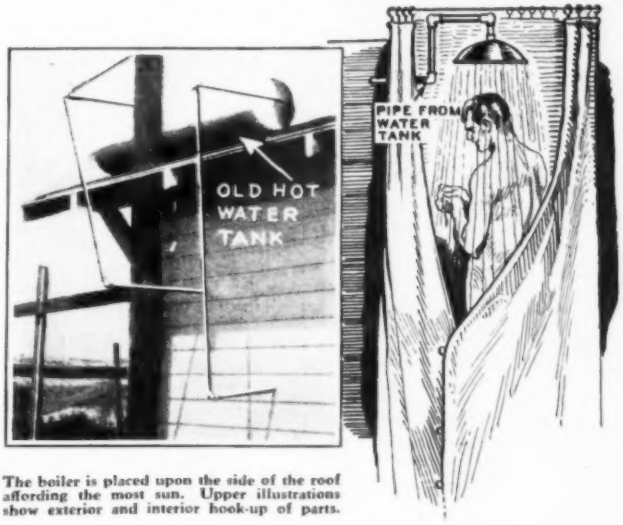
The wheels are standard front wheels of Model A Ford cars. There will have to be special crucible steel spindles made with a little offset so they can be underslung on the tubular axles, which can be 2¼" seamless steel tubing of heavy gauge. The front wheels employ standard spindles, and the tie rod hook up is as shown in the drawings.

Spring casters must be cast, and bolted thoroughly to the 4½"x2⅝" channels. Then the usual shackles are installed.

The jacks are removed from their bases and through-bolted to the channel in the manner shown in the drawing. The ends of the mitered channels are counter bored for the end of the screw shaft. Such a trailer will hold about 2 to 3 tons safely.

The Water for This Shower Is Heated by the Sun's Rays

HERE is a stunt, although not as reliable as modern home plumbing, that proved very satisfactory to an enterprising farmer. He got an old hot water boiler and set it up on the garage roof where the sun's mid-day rays warmed the contents to a temperature that was "just right." It served him as an after-work shower.



The boiler is placed upon the side of the roof affording the most sun. Upper illustrations show exterior and interior hook-up of parts.

The installation is so simple and satisfactory that anyone may use the idea with reasonable results. In this case a telephone pole alongside the garage served to support the boiler. A block of wood nailed upon the roof will do just as well. Two pipes lead to the tank. One is from the water pipe and, turning a valve, runs water through this and fills the tank. The other is connected to the pipe and runs through the garage wall little more than head high where it is connected to a sprinkler.

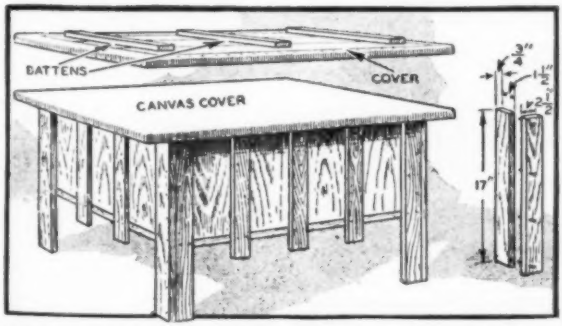
Users should run water into the tank at noon allowing the full sun's rays to play upon the tank for several hours. You will be surprised how quickly the water will heat up to a high temperature.

There is one thing to remember: be sure that the space beneath the shower is well graveled and that the used water will drain off easily. For clay ground dig a hole beneath the shower and fill with cinders.

This Attractive Box Makes a Handy Container for Garden Accessories

YOU will find this box handy as a container for small garden tools, markers, seed envelopes and other accessories.

Select a strong, tight box for the job. The size isn't important, but a good one is that of the box used for the model, shown below, which was 16 in. wide, 20 in. long and 11 in. deep. Make the legs of two strips each with one strip ¾ in. wider than the other to allow for overlapping its edge. Nail the strips together, then nail them to the box sides. Make the top of boards of the right width and length to project over the box sides and ends. Batten the boards together on the under side, cutting the battens of the right length, and placing them at the right distance from the ends, so that they will hold the top in position.



Legs are cut and fastened to the garden utility box as illustrated in drawing above. The canvas covered box makes an excellent garden seat.

You will want to make this utility box watertight, so cover the top boards with canvas. Lap the canvas over the edges of the boards, tack to the under side, and apply two coats of paint.

Finish the sides of the box with pieces of lattice strip, cut off the right length to project 1 in. or so below the box bottom. Nail these strips to the sides and ends of the box, with equal spacing.

To make a finished job, paint the box inside and out, with two coats of white paint and trim with any desired color.

Greyhounds on Old Greek Coins

Modern greyhounds form design of ancient Ægean coins.

THE discovery of a number of ancient Ægean coins with relief pictures of greyhounds, used around 500 B. C., proves conclusively that Greek dogs were very similar to our "stream-lined" greyhounds.

Newfoundland's History on Stamps

HISTORY is presented pictorially on the stamps of Newfoundland, which show scenes from the life of Sir Humphrey Gilbert, founder of the colony.

His home, the castle at Compton, Devon, England, and his school, Eton College, are shown on the two and four cent stamps respectively. Queen Elizabeth, portrayed on the 24 cent issue, is shown on the 7 cent value granting a commission for discovery and colonization in America. The token received from the queen is reproduced on the five cent stamp.

Newfoundland's 8 cent stamp shows Sir Humphrey's departure with five ships from Plymouth, England, in 1583. The next two values show the arrival at the present site of St. John's and the annexation in the name

(Continued on page 116)

Above stamps commemorate 350th anniversary of founding of colony of Newfoundland by Sir Humphrey Gilbert.

Rarin' to Go!

HERE'S the ruggedness and spirit of the cow-pony combined with the grace and speed of the racehorse.

There's 36 real horsepower in that big, high-speed motor — rarin' to go when you crack the throttle. No bronco buster ever had a mount to compare with the 1934 "Fighting Heart" Harley-Davidson!

Idling along a winding woodland trail, or hurtling down the highway, this modern thoroughbred instantly obeys every wish and whim of the rider — it becomes part of him.

Here is a mount to be proud of, with its Air-Flo styling and striking color combinations! Economical in operation and maintenance, too.

Drop in at your Harley-Davidson Dealer's — swing into the saddle of one of these super motorcycles — and picture yourself streaking down the highway, leaving traffic far behind. Ask about his convenient payment plans that make ownership so easy. See him today.

Harley-Davidson Motor Co., Dept. MM, Milwaukee, Wis.
Interested in Motorcycling. Send illustrated literature. Postage Stamp is enclosed to cover cost of mailing.

Name _____

Address _____

My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.

Mail this coupon

Ride a

HARLEY-DAVIDSON

Newfoundland's History on Stamps

(Continued from page 114)

of the queen. The 20 cent stamp shows Sir Humphrey's map of the island.

Sir Humphrey left for England in his smallest ship, which ran into a storm. He refused aid from another ship with the words "We are as near to heaven by sea as by land." The scene is shown on the 15 cent value. That night the ship foundered and Sir Humphrey was lost.

Doctor Collects Horse Brasses

Dr. H. L. Gauntlett, of England, examines his unique collection of 550 different brasses. These decorations were used on horses' harnesses as far back as the Middle Ages.

DR. H. L. GAUNTLETT of Putney, England, has one of the most unique hobbies in the world. He collects the brasses used in decorating horses' harnesses.

The collection already contains 550 different specimens, many of which date back to the Middle Ages.

Presidential Medals Sold for $1

THE President's medal, struck off in honor of every president from Washington to Roosevelt, is now available to the public. It is of bronze, three inches in diameter. Government officials and even President Roosevelt will have to pay the $1 charge made by the Philadelphia mint.

President's medal available at $1 at Philadelphia mint has on face profile of Roosevelt and date of his inauguration. Shield of U. S. and American eagle appears on reverse side.

Deny Indian Was Model for Nickel

ALTHOUGH known as the "buffalo nickel Indian," Chief Two Guns White Calf, who died recently, never posed as a model for the profile appearing on the U. S. five cent piece.

James Earle Fraser, who designed the coin, said that several Indians posed for him, but Two Guns was not one of them. The coin was first minted in 1913.

Chief Two Guns White Calf, whose profile greatly resembles the Indian on United States buffalo nickel, died at the age of 62 at Blackfoot reservation.

ADLETS FOR HOBBYISTS

STAMPS

ZANZIBAR! Packet queer freakish stamps from Zanzibar, Algeria, Sudan, Malay States, Victoria, Gold-coast, Nigeria, British Colonies, Souamericans. Don't delay! Don't wait. This whooping packet free for 5c postage. Gray Stampco, Dept. M.M., Toronto, Canada.

15 DIFFERENT Mint Blocks and 25 different used United States Stamps, 15c. Albert C. Butzen, 7431 Gratiot Ave., Detroit, Mich.

STAMPS! 100 diff. 2c; 500 diff. 35c; 1,000 diff. 90c. Tatham Stampco, D9, West Springfield, Massachusetts.

LOOK! Gorgeous packet including Uruguay (flying horse) airmail, Spanish airpost, triangle, and ship stamps, only 5c to approval applicants. Royale Stampco, Box 56B, South Pasadena, Calif.

PREMIUMS with approvals, 3c postage. Harold Bowen, Fort Dodge, Iowa.

250 MIXED Stamps Free to approval applicants only sending 6c postage. Yakima Stampco, Yakima, Wash.

200 SHIPS, Colonials, etc., 10c. Monjar, 1553 Knox, Cincinnati, Ohio.

ALBUM, 4100 spaces; 1000 hinges; 215 different foreign; 25 airmails; 25 Japan; Tongs. All 50c. Burtis Co., Saratoga, (5) N. Y.

1863 LOMBARDY-VENETIA, Corea, Marienwerder, Afghanistan, Surinam, Allenstein, genuine Baden, and $5 U. S.—Absolutely free to approval applicants enclosing 3c postage! Viking Stamp Co., Dept. M, Sheepshead Bay Station, Brooklyn, N. Y.

UNITED States stamps—40 different with price list 10c. Seidenberg, Baroda, Mich.

TRIANGLES and 30 different Charkhari, Liberia, Azerbiajan, Inini, Costa-Rica, etc., 5c. Gardner, 5220 Cuthbert, Baltimore, Md.

105 DIFFERENT; Congo, Hyderabad, Inini, Travancore, Ubangi, etc., 3c to approval applicants. Extra-Pictorial Set Free with above. H. Hunzikemr, Jordan, Minnesota.

HEADQUARTERS—Penny Approvals. Low price sets. Wonderful Selections. Elyria Stamp Company, 437M, Elyria, Ohio.

COINS

$5 to $500 EACH paid for Old Coins. Keep all old money. Get posted at once. Send 10 cents for Illustrated Coin Value Book 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

OLD MONEY Wanted. $5.00 to $2,500.00 each paid for old coins. Buying catalog 10c. Robert Cohen, Box 483, Muskogee, Okla.

OLD MONEY wanted. List of valuable American coins I buy, 12c. R. Smith, Coin Collector Shop, 2422 Ried St., Flint, Mich.

COINS, California gold quarter size 27c; $½ size, 53c. 3c piece and coin catalogue, 10c. 200 different stamps and stamp catalogue, 10c. Norman Shultz, Salt Lake City, Utah.

New INVENTION SAVES GAS!

7 MILES MORE PER GALLON on PLYMOUTH

MOTORIST SAVES $180.00 a YEAR*

Saves up to Thirty Per Cent On Gas. Provides Faster Pick-Up—More Power—Greater Mileage and Smoother Running.

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Telephone Main 187

March 15, 1934.

Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin.

Gentlemen:

I thought it might be interesting for you to know that I had an automatic gas consumption tester attached to my Plymouth Six and obtained an average of 15 miles to the gallon. I then installed your Vacu-matic to satisfy myself as to its merits and under the same conditions and the same course of travel I obtained an average of 22 miles per gallon, which you see is an increase of 7 miles per gallon. At our present price of gasoline and traveling approximately 1500 miles a month, this means a saving to me of $15.00 a month or $180.00 a year.

I am writing this letter unsolicited on account of the satisfaction I have had since this installation.

You may use this letter as you see fit.

Yours very truly,

F. S. PECK INSURANCE AGENCY,

By

FSP/H

VACU-MATIC

Patent Pending

the Carburetor Control that "Breathes"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, greater speed and smoother running . . . unfolding a new driving thrill for you!

Entirely New — Nothing Like It!

The self-starter—four wheel brakes—knee action—streamlining . . . and now VACU-MATIC! The greatest motor improvement of recent years! With it, engineers have achieved a practical means of AUTOMATICALLY balancing air and gasoline in correct proportions for ALL speeds! Functioning directly with the manifold vacuum, VACU-MATIC actually "breathes" when needed, giving your motor correct combustion. Sharply cuts fuel wastes, saves dollars in gas costs, reduces carbon and gives your engine new pep, greater power and longer life.

Agents and Salesmen

If you are interested in earning up to $15 daily, check coupon. Exclusive territories now being granted.

Fits All Cars

VACU-MATIC is constructed of six parts, electrically welded into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

The VACU-MATIC Co., Wauwatosa, Wis.

* The above letter from California is unsolicited, and is just one of the many letters received from enthusiastic users.

Guaranteed Gas Savings

The VACU-MATIC proves itself on every car. It is guaranteed to give worth-while gas savings, quicker pick-up, and more power or it costs you nothing. "On a test I gained an average of 4 miles on a gallon," writes Alex Wertz. "Vacu-matic is the best I have ever tried." Clarence Rutzin—"I have tried the Vacu-matic on several tests and find that I get between 5 and 6 miles per gallon increase, have more mileage, have greater pickup."

Free Details

Learn about this remarkable device that so greatly affects the entire performance of your motor. Learn why your car is costing you extra money to operate without VACU-MATIC. See why your VACU-MATIC equipped car will leap away from traffic without sputter or hesitation. Discover a new driving thrill and enjoy the savings that more than offsets VACU-MATIC's slight cost. Get the facts! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-35 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name .....

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☐ Check here if interested in selling proposition.

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Treasure Hunters
Big $5 VALUE Only $2.50

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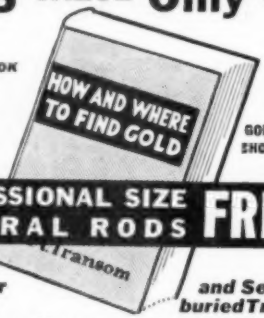

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(Check how you want book sent)

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City ..... State.....

Build a Wind-Electric Generator

(Continued from page 97)

Wattages of the bulbs are obtained by remembering that one candlepower is approximately equal to one watt.

The wind generating plant shown in the drawings is easily made from the following parts: an auto generator in good condition, with cutout; an ammeter; a hand grinder gear in serviceable condition; a length of 2x4; a piece of plywood or heavy sheet metal for the vane; brass and copper for commutators; automobile fan pulley for pivot bearing, and the material needed for the tower.

Shaft Speed at the Generator

The generator will have to be made to turn from 600 to 1800 r.p.m. This is equal to the variable speeds met with in general auto service. To attain this shaft speed at the generator it is necessary to "spread a large sail" in the wind-driven propeller and turn it over slowly, thus extracting fullest benefit from the wind. To achieve these two ends some sort of gearing between the propeller and the generator must be used. The gear from a hand grinding tool proved successful. This has a ratio of 1 to 10. A Heath airplane type propeller was used and revolved 90 times a minute, turning the generator 900 r.p.m. resulting in a 5 amp charging rate.

Windmill type flat blades can be used for the propeller, but it will be necessary to experiment to find the correct blade area and diameter. I have found that the blade angle had best be 30 degrees, as this seems to start best in light airs. The size of your propeller will depend on the amount of average wind you have and upon the gearing ratio. The higher the ratio between the driven shaft and the generator drive shaft, the larger wheel you'll need and the more slowly it can turn.

Building the Prop

Old war surplus airplane propellers can be bought at low cost, but if you are going to do much experimenting, you had better build the simple four blader shown in the drawings. The machine illustrated in the photographs worked satisfactorily with a Heath prop, a ball bearing hand grinder and a ball bearing Autolite generator from an Austin car.

The drawings shown describe how the 2x4 frame is cut and fixed with a plywood or sheet metal vane tail. The areas given have worked well in a fifteen to twenty-five mile average southwest wind. At the point where the combined weights of generator, windmill and tail balance (center of gravity) a hole is bored to accommodate the fan pulley.

The hole for the fan pulley is cross bored, and plugged with mud, and Babbitt that is molten so that it will barely char a white pine stick is poured in. This anchors the pivot like grim death.

The mounting for the generator and the hand grinder and prop are explained in detail in the drawing. Two holes are drilled in the bench feet of the grinder, and not only is the hand clamp screw tightened thoroughly, but two bolts are put through the feet and

(Continued on page 134)

and 55 OTHER Grand Cash Prizes

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HERE'S a lot of cash for some one. Would you like to have it? I am going to give it away. We want to advertise our business quickly and get wide distribution for our products. Someone, maybe you, will receive new Buick Sedan and $1,250.00 cash extra for promptness or if you win 1st prize and prefer all cash you get $2,250.00. Duplicate prizes paid in case of ties.

Surely you would like to have this magnificent prize. Then **fill in the coupon below and you can easily qualify** for the opportunity to win as much as $2,250.00.

This is our unique way of advertising. We want people everywhere to know us and to share in this great distribution of money. Besides the first grand prize, **$2,250.00** including promptness, there are 59 other big cash prizes. The second grand prize is **$750.00 cash,** third grand prize is **$300.00 cash** and many others. **Thousands of dollars more in Special Cash Rewards** which we will tell you all about when we get your answer. This is your opportunity. Answer today — qualify for your share of this money that must be given away. No subscriptions to buy or sell. No more puzzles to solve. There is nothing hard to do to qualify to win the Buick Sedan, but **you must act quick** to make the most of this opportunity. Just mail the coupon if you find 5 of the hidden faces. **Do it NOW!**

Can You Find 5 Faces?

It is fun to look for the hidden faces in the trees, clouds, etc., in the picture at the right. Are your eyes sharp enough to find them? Some look straight at you, some are upside down—others are sidewise. It is not as easy as some people may think, but don't give up —keep looking and you may find them. **When you do, mark them and send your answer right away. Quick!**

Many people have received big cash prizes from companies with whom I have been associated. **Some have received several thousand dollars.** Names gladly furnished on request. **Answer today and see for yourself if you can win the first prize.** Oh Boy! what you could do with $2,250.00 all in cash at one time. I will be glad to pay it to you if you are adjudged the winner.

Hurry—mark the 5 faces you find, send your answer quick. You may be the one to receive the $2,250.00 prize.

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Remember, **send not one penny** with this coupon—all you do now is to find 5 faces, if you can, and mail the coupon. We will answer you right away and tell you how you stand.

The money to pay every prize is on deposit in a **big strong Des Moines bank.** Get your share of $4,305.00 in cash prizes, besides thousands of dollars in Special Cash Rewards. Sixty grand prizes in all. All prizes will be paid promptly. Hurry! Just mark the faces you find and send with coupon right away. Some one wins —maybe you. Send your answer and see for yourself if you win first prize. **DON'T DELAY! . . . Mail your answer today.**

G. F. STAYTON, President — Dept. 720
1912 Grand Avenue,
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I have found 5 faces in the enclosed picture and I want to win. Tell me how I stand.

My name.....

Address.....

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230 S. Wabash Ave. Dept. MME-6H, CHICAGO, ILL.

Use Camera to Enlarge Negatives

(Continued from page 104)

Two or three layers of black cloth are folded together and tacked down to form the bellows.

The lamp housing is made of four pieces of sheet metal soldered together. A small lamp shade holder is soldered in the small opening to support the lamp socket. Give the inside one or two coats of aluminum paint. Before fastening lamp housing to negative frame, place the sheet of flashed opal glass in the negative frame, and a 60 watt bulb in the socket.

The easel is made of plywood, and supported by two sections of a yardstick sliding in slots cut in the baseboard. Wax the slides to make them run smoothly.

Give the outside parts of the enlarger a coat of dull black paint.

Glue a sheet of white paper to the easel, on which to focus the image. Insert the negative in the frame upside down, with the dull side toward the easel. Open the camera shutter, turn on the light, and focus by moving the bellows and easel until the desired size and sharpness is obtained. Tighten the thumbscrews on the slide to keep the easel in position.

Place an orange or ruby filter in front of the camera lens to give enough light for proper placing of the bromide paper on the easel without fogging. Expose according to instructions for the particular paper being used.

To make prints smaller than the original negative, extend the bellows full length and move the easel until the image is sharp. Since the amount of light coming through is greater on reductions, better results will be secured with contact paper (chloride paper).

Distorted enlargements giving many queer effects are made by hinging the easel and tilting it in different directions.

MM Sponsors Workshop Society

(Continued from page 41)

The organization of your club, its name and the names of the officers will be published in MODERN MECHANIX AND INVENTIONS, the official magazine of the Society. From time to time the activities of your club will be reported in the official magazine.

MODERN MECHANIX AND INVENTIONS agrees to sponsor special contests and projects for the clubs and club members only. The magazine's editorial board of experts will answer any questions or help to solve any workshop problems of the clubs or their members. It will assist you in organizing a club and suggest activities and programs for meetings.

Bona fide members of the Society will be able to obtain subscriptions to the official magazine, MODERN MECHANIX AND INVENTIONS, at a considerable discount from the usual subscription rate. Members will also be able to secure at a discount any of the blueprints listed in the Blueprint Booklet of MODERN MECHANIX AND INVENTIONS.

Buried Alive With Tunnel Builders

(Continued from page 43)

are married to sandhogs, and our sons are in the same business.

"As a matter of fact, there hasn't been an outsider in our family for four generations. If you're not a sandhog, with a sandhog's blood in your veins, then you're not a Redwood. At least, not our Redwoods."

Walter Redwood, who is forty-one, started his tunnel career at the age of thirteen in Birmingham, England, on a railroad bore. He was a dynamiter's helper and got five cents an hour for his services.

"In 1910 I came to New York City," he says. "There was a demand for tunnel experts in those days and in the following years I worked on practically every important tunnel job in New York City and the rivers which flank it.

Ninety Feet Under Water

"This Newark contract is an air job, calling for work ninety feet under water. Because of the high air pressure under which we work, we put in one hour of actual work while we're off duty the next five. We work just two hours of a twelve-hour day under a pressure of thirty-four pounds to the square inch.

"This is about as perilous a job as I have ever worked on. We are working in a steel and concrete caisson, eighty by thirty feet. This caisson sinks with my crew of workers. That is, as we dig down and make room, the caisson wedges downward. Every pound of air that we put on takes 250 tons off the weight of the caisson. That is, each pound of compressed air lifts the equivalent of 250 tons weight in pushing the 'deck' or 'ceiling' of the caisson upwards.

"As soon as the air is dropped two or three pounds, the caisson drops right down. That is the terrific force of its weight. On this job I am in charge of the air-lock. I operate the compressed air instruments and you can easily understand what a slip or a flaw in judgment might mean.

"Bends" Affect Workers

"The most common ailment from which the sandhog suffers is the 'bends.' This malady also affects deep-sea divers. It comes from a too sudden change in pressures. Either going from normal to under-pressure or vice versa has been too fast, and you get air-bubbles in your blood, preventing the normal flow.

"When the sandhog reports for work, he goes down the shaft and enters the air-lock. He sits there as the lock-tender works the pressure up to a point equal to that in the tunnel.

"The highest pressure he can work under is fifty pounds to the square inch. Under these conditions, he works for just half an hour, resting for the next five. After his time is up in the tunnel, the worker enters the air-lock again where the pressure is reduced gradually until it is the same as that above ground.

(Continued on page 123)

BE YOUR OWN FIXER
AND SAVE THE REPAIR MONEY

Typical repairs that can be made perfectly with Smooth-On: Stopping leaks in steam, water, gas, oil or stove pipes; mending cracks, breaks or leaks in furnaces and boilers, radiators, tanks, sinks, pots and pails; making loose handles tight on umbrellas, knives, hammers, brushes, drawers, etc.; tightening loose screws, hooks, locks, door knobs, etc.

On the Automobile: Making cracked water jackets and pumps good as new; stopping leaks in radiator, hose connections, gas tank and gas, oil and exhaust lines; making a fume-proof joint between exhaust pipe and tonneau heater; tightening loose headlight posts; keeping grease cups, hub caps, and nuts from loosening and falling off, etc.

Practically every householder spends at least $10.00 to $50.00 each year and many spend several times that much on the above and other simple repairs that can be made *quickly, easily, well* and at almost no cost with Smooth-On No. 1.

With a can of Smooth-On you can save much money in your own home—and by doing similar repair work for others, you can *make* money.

No skill is required to make repairs and the amount of Smooth-On used on any one job seldom costs more than a few cents.

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30x4.50-21		2.40	.85
28x4 75-19		2.45	.95
29x4.75-20		2.50	.95
29x5 00-19		2.85	1.05
30x5.00-20		2.90	1.05
28x5.25-18		2.90	1.15
29x5.25-19		2.95	1.15
30x5.25-20		3.05	1.15
31x5.25-21		3.25	1.15
28x5.50-18		3.30	1.15
29x5.50-19		3.35	1.15
30x6 00-18		3.40	1.15
31x6 00-19		3.40	1.15
32x6.00-20		3.45	1.25
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32x4½	3.35	1.15
33x4½	3.45	1.15
34x4½	3.45	1.15
30x5	3.65	1.35
33x5	3.75	1.45
35x5	3.95	1.55

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Conquering Jungle Killers

(Continued from page 49)

gun off in your face, crack a whip at you and dance in front of you with a chair or a spear in my hand. You'd be afraid, wouldn't you?

"But on the other hand, if I offered you something to eat and talked nice to you—then you'd like me, wouldn't you? Well, a tiger is the same in that respect as a human being. If you're nice to them, they'll like you. They won't be afraid of you; and not being afraid, they won't want to hurt you. A number of trainers use guns, whips and other weapons because they're afraid of the animals, while the beasts snarl and watch for a chance to attack or escape because they're afraid of the trainer.

First Step in Training

"When a wild animal is captured," he went on, "it suffers a great shock and usually a great deal of pain. Naturally it regards man as its enemy. My first job is to convince the beast that I am his friend. First I feed it bits of meat from the end of a long stick. Gradually I shorten the stick, and in a few weeks—and sometimes days—he is eating out of my bare hand. All the time I talk to him gently, and when the proper time comes I stroke his ears and back. Then I go inside the cage and pet him as I feed him, talking to him all the time. Soon he will follow me around the cage to get his tidbit, and if he has to get up on a stool or place his front paws on my shoulders to get the meat he will do so. Finally he comes to understand that he must do these simple things to get the morsel he wants."

Early Circus Days

Captain Proske's work is motivated by a genuine love for his animal charges. As a boy of fourteen he ran away from his home in Vienna to join a circus. After serving an apprenticeship as a wire walker, bareback rider and trapeze artist, he graduated into menagerie work. By the time he was twenty, he had his first animal act, a nine-foot Russian bear weighing half a ton.

The Captain still carries a memento of his bear-training days—a solid row of gold teeth in his upper jaw. Since that time, he has suffered countless other injuries. His muscular arms are solid masses of scar tissue, the grim handiwork of fang and claw.

Once, in Budapest, the Captain almost lost his life. He was working with eight tigers in Beketow's circus. He had turned his back upon the biggest tiger of the lot when suddenly the beast let out a fearful roar, sprang across the cage and seized the trainer across the rear of the thighs.

"The attendant outside the ring immediately opened the door to the chute, and with the aid of several stage hands armed with poles, succeeded in driving the other seven tigers from the cage. Unfortunately the fellow who had me decided to go along, and as he dragged me crosswise through the exit I was knocked unconscious.

"The keeper had no gun—nobody back-

stage had a gun. My tiger was making a meal of me in his own cage, while the keeper dashed to the manager's office, where he knew a loaded pistol could be found. They had to kill that tiger and pry his jaws apart to get me. I spent five months in the hospital."

Yet despite his harrowing experience, the Captain uses no weapons in his performance. "If my keeper had a gun," he says simply, "I'd be depending upon him too much. As it is, I know it's up to me to go through with the act, no matter what happens."

Captain Proske makes light of the dangers of his hazardous profession. Disobedience or unwillingness to perform generally indicates that he has failed to gain the animal's confidence. Hence, he holds no malice against an occasional unruly member of the troupe.

"You see," he says, "I love my animals and I believe they love me. I am the only one to feed them. I soothe them when they are sick and restless. I never hurt them or frighten them. And I believe that, like humans, they enjoy working for an employer like that."

Buried Alive With Tunnel Builders

(Continued from page 121)

"Here is how we go about burrowing underground, and under a river at that. Deep shafts are sunk on either side of the river and elevators are built into them.

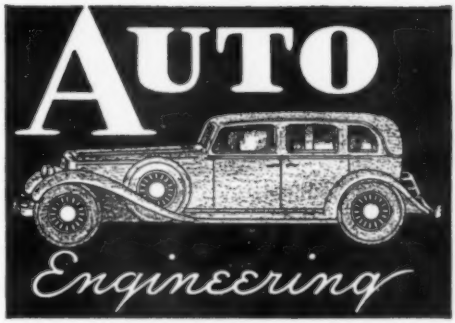
"A huge circular shield of steel about twenty feet in diameter is then lowered into each shaft. Working toward each other from their opposite terminals, the shields are started forward, pushing through rock, mud and gravel under the mighty force of compressed air. A meeting-place for the two shields has been designated at a point midway under the river.

"As the shield pushes its hood through the course of the proposed tunnel, the passage is filled with debris which the sandhogs tackle with pick and shovel and load onto cars which carry it back to the elevators where it is removed to the surface.

"When the tunnel is being driven, big steel rings, made up of radial plates, are bolted into place to form the strong ribs of the tunnel. When this set of rings is finished, the shield is then moved forward again, and then more rings are bolted into place. This process continues until the tunnel is holed through."

The average sandhog gets $7.50 an hour, or $15 for a two-hour day. The eldest of the Redwoods, Harry, has often been paid $100 a day for his services. But although the rewards are high, the penalties are even higher. Death lurks in the underground caverns and no man knows, going down to the airlock in the morning, whether or not he will return safely again that night.

SEND FOR FREE COPY OF MODERN MECHANIX BLUEPRINT BOOKLET



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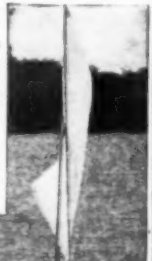

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NEWELL PHARMACAL COMPANY

Dept. 445 Clayton Station St. Louis, Mo.

Victory, World's Fastest Model Boat

(Continued from page 107)

grooves straddle the hull, then pin keel down solidly until cement sets.

Notch each side of keel at bow, as shown, to fit sideplanks. Cement grooves and set forward ends of planks in place, securing with several pins. Before bending planks, allow cement to become perfectly hard so that front-ends will not spring out of place.

Then bend both side planks around the frames at the same time and slip a strong rubber band over the ends that extend beyond the transom or stern of boat. Pin planks firmly to ends of frames and cement all edges. Always leave the pins in hull until cement is firm, for they are your "clamps."

Effecting Curves at Forefoot

The hull can be turned upside down and the garboards, the two planks which adjoin the keel, set into place. The necessary curves at the forefoot can be effected by forcing the ends down with several pins protruding from the keel. Assemble outer planks and do not trim overhanging edges until cement is secured.

Make a mast-step out of a block one inch square and ½" thick by cementing together excess keel wood. Cement block to top of keel inside the hull with its center 6 inches from the extreme bow.

For the decking use three strips, laying the center one first along the center line of hull, after cementing top of frames. Secure deck planks in same manner.

Cut an aluminum sheet to shape for the fin as per drawing. For ballast fashion a semi-circle out of lead 1¾"x1¾"x¾". Cut slot lengthwise into top of straight side ⅜" deep and fit over bottom of keel, securing with liquid solder. Attach keel to hull with solder.

Rudder should fit through hull with tubing, the bottom of which is water-tight. Tiller is soldered to top of rudder post.

Finishing the Hull

Sand hull thoroughly with fine sandpaper, then paint hull and shellac boom and mast. Balsa wood absorbs water, so do not place hull in water until it has two coats of paint.

As a mast step cut off head of pin and insert in bottom of spar allowing pin-point to protrude ¼". Cut hole in deck six inches from bow to take the mast. When boat is completely rigged place spreaders on spar by cementing.

Lay a fine grade of muslin out on a flat surface, pin down, and cut out for the sails. To prevent edges of both sails from raveling apply a narrow strip of cement with a stick along the edges, and lay a thread along sides of both areas.

Attach foot of mainsail along boom, then secure to boom and mast with thread loops. Rig mast with strong linen shrouds; secure boom to mast, using bent pins glued in place for fittings. Rig the mast so that it

Victory, World's Fastest Model Boat

tilts toward the stern about 1½" off perpendicular.

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Speedway Rules Develop Diesels

(Continued from page 55)

only begun to speed. With a single seater and a new-found companion, the super-charger, Peter De Paolo in 1925 won with the almost unbelievable average of 101.13 miles per hour.

Then came the midget racer. The displacement was cut to 91½ cubic inches in 1926, but Frank Lockhart drove a Miller special 95.88 miles per hour to win. It was Lockhart who invented inverted carburetion.

An automobile was of little use if it could carry no more than one passenger, such as the midget designs. And what of the stock cars. Accordingly, in 1930 the rules committee encouraged the entry of stock cars by limiting the piston displacement to 366 cubic inches, where it has remained.

Because five lives were lost during the trials and the race last year, the rules committee has introduced the gas and oil limitation, hoping to cut down the speed.

A new development in this year's race is the replacing of the four-cycle motor with the two-cycle motor. A distinct advantage to this type of motor is that it requires less than half the parts needed by the four-cycle motor with a consequent saving of oil and weight.

Commenting on the restriction with regard to the limitation of gasoline, Col. E. V. Rickenbacker, president of the Speedway Corporation, said:

"This rule is not as strenuous as it might seem to be. Engineers believe that the new gasoline rule will not only inspire race car builders to enter better power plants, but be an incentive to better driving."

The races have taken a toll of lives. A roaring car will spin, careen, and dive over a retaining wall. The driver and mechanic are pulled out of the flames or tangled wreckage dead or seriously injured.

It seems a useless spectacle to some, but in every crash engineers have something to study. Some part of the car has given way. Something was at fault if the human driver himself did not make the mistake. These death dealing races have developed better tires, nearing the puncture and blowout proof stage; more powerful and economical motors requiring less space; stronger chassis to reduce injuries in accidents; better wheels to stand the strain of shock and speed; fewer parts in the entire car to reduce weight; and above all streamlining for greater speed.

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Mysteries of Ancient Manuscripts

(Continued from page 83)

two sets of writings revealed that first the vellum contained a record of rentals of Italian lands and that the thoughts of Valerius Maximus were written thereon by a scribe more than a century later. Little did the monk who scrubbed out those lines think that the magic eye of a later day science would restore them to the world.

Restoring Lost Inscriptions

A common problem is the reading of inscriptions that have been obliterated by other ink. Among Nathaniel Hawthorne's letters to his wife is one dated January 27, 1841. Twelve lines were apparently completely lost under heavy, wavy ink scrawls. In a short time this letter, having been laid out on the table of a darkened room, was brought under the gaze of a compound binocular microscope. A powerful spot lamp, casting its condensed rays through a filter, enabled the investigator to look through the top layer and read the original lines as though no change ever had been made.

An entire line was found omitted in Pier's Plowman, a famous manuscript of the Middle Ages. Several lines had also been erased and written over. Yet the ultra violet light and the microscope quickly restored traces of the seemingly missing line and brought out for inspection those which somebody, perhaps the author, had attempted to change.

The ultropaque microscope, used for a study of opaque objects, makes possible some illuminating studies. This is an instrument containing its illumination within itself, the light shining directly down on the object being studied through a ring around the lens. A rheostat controls the amount of light and by shifting a metal stop, the operator can cut off the light on one side, thus casting an oblique beam downward.

Tracing Benjamin Franklin's Diary

This instrument made possible the revelation of the Lincoln forgery. With it annotations on Benjamin Franklin's diary have been traced from beginning to end, thus fixing the time of their addition to that important record.

Mr. Albert S. Osborn, New York handwriting expert, has given the paleographer one of his most important aids in the form of a series of 15 measuring instruments. With these Captain Haselden picks out easily and quickly the penmen, or scribes, who have written medieval manuscripts for the authors.

The instrument most commonly used measures the angle of the slope of handwriting. This consists simply of a number of ruled lines on an oblong glass, graduated at different angles.

Other similar instruments make possible the measurement of angles within individual letters, the degree of curves in letters, the proportion of parts within a single letter or with other letters and the width of pen

Mysteries of Ancient Manuscripts

strokes. So accurate is the last-named, in fact, that on occasion the change in a quill pen was noted after the scribe had repaired it with a knife!

Measuring Changes in Handwriting

The thin lines on these pieces of glass enabled Captain Haselden to prove that suspected forgeries of William Dean Howells' handwriting were genuine inscriptions made by the author at a time when his manner of writing was changing. Although the form and character of Howells' writing were greatly altered during this period—from 1865 to 1891—the ruled lines on the glass instrument proved that the proportions were the same.

Frequently two inks in a single writing require a comparative study. The need for this finds its modern counterpart in a raised check. If it has been raised, though a microscope alone ordinarily would not detect the flaw, a comparison of colors of the two inks under Captain Haselden's instruments quickly reveals the fraud.

To match an ink, the operator focuses one objective of his double-barreled microscope on the ink to be matched. In a dish under the other aperture he places a specially prepared powder of neutral color. He then focuses on the ink mark and changes tinted glasses until he sees the same color through both barrels of the instrument. By changing inks he quickly observes whether they are the same.

Solving Ancient Mysteries

The mysteries of ancient inks no longer confuse and perplex the scientist seeking out their secrets. Under the ultra violet light ink looks as fresh as though it were written a moment before. Invisible inks fluoresce and cast shadows which can be seen, while ordinary inks, imbedded in the paper, reverse the process by preventing fluorescence at those points and appear black as jet.

So delicately attuned to change are modern instruments that they quickly reveal which of two crossed pencil lines was written earlier, whether a pencil or ink line, if crossed, was written later. Through them Captain Haselden even distinguishes between old and modern pencil pigments and discovers the difference in striation of different makes of pencils.

On many medieval documents the date has been hopelessly lost. These include court rolls, manorial documents and water-stained letters in which the writing seems to have disappeared. Postmarks, though the earliest was as recent as 1661, often are unreadable. Watermarks and seals frequently are damaged, while ink quite frequently is found obliterated.

Despite these seemingly insurmountable difficulties the penetrating eyes of science project themselves backward hundreds of years and learn astounding facts about rare writings and their authors that not even their contemporaries suspected.

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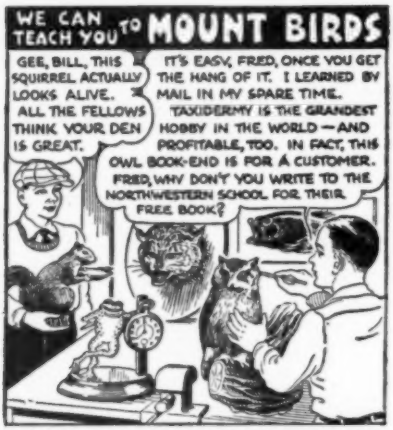
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Northland—Rescue Ship of Arctic

(Continued from page 78)

passions often were unchained. It was at Point Hope that the natives conspired to murder their cruel, tyrannic chieftain, Ahten-ow-rah. Lots were drawn to choose the slayer and, after a shot through the window of his igloo had wounded him, one of his wives, in the plot, finished him with a knife. But those turbulent times are gone. Uncle Sam stamped out the liquor menace years ago; and every sea captain knows now, with the *Northland* on watch, what it would mean if he were caught giving "fire water" to the natives.

A Timely Rescue

Another of the *Northland's* deeds, a mere incident in her day's work, was the rescue of two men seen, through glasses, staggering along the shore about twenty miles east of Point Barrow, desperately signaling to attract notice. After a small boat had taken them to the ship, it was found they were Jack Robertson of Oakland, Calif., and Ewing Scott, assistant director for a Hollywood motion picture outfit. They and three others had been flying in two airplanes from Fairbanks to Nome when their plane was forced down. For twenty-one days they had been lost, while rescue parties searched constantly for them. Starved, unkempt, their strength almost gone, they were in despair. But the *Northland* picked them up and took them to Nome.

Tragedy and death followed the ship *Good Hope*, despite rescue by the *Northland*. The cutter was at Teller when the radio station at Deering, 250 miles away, reported the *Good Hope* helpless, her engines broken down, in Kotzebue Sound nearby. It required twenty-four hours for the *Northland* to reach her. She was towed the entire distance to Teller, where she was repaired and put out to sea again. A month later, however, the wreckage of the *Good Hope* was washed up on the beach at Cape Prince of Wales. She had capsized and broken in two on the shoals in a terrible storm, going down with all of her crew.

Crashing Through Ice to Safety

When winter begins to close in, the *Northland* keeps track of all of the ships remaining in the ice region. Knowing the steam freighter, *A. J. Baldwin* had started from Nome to Seattle, the *Northland* found her fifty miles south of Nome, befogged and hemmed in with ice. Her lookouts could see nothing through the dense fog. Crushing her way through the menacing ice field, the cutter piloted the helpless vessel out of immediate danger and told her of a "lead" out of the ice, several hundred yards wide, four or five miles away.

The dramatic discovery and rescue of "Jimmie" Mattern, famous 'round-the-world flyer, whose airplane had crashed at Anadir, was emblazoned to the world from Nome. Radio advices from the Presidio, San Francisco, after Mattern had resumed

(Continued on page 142)

The LOW DOWN on BING CROSBY

by his brother, LARRY CROSBY

Things you never knew before about Bing Crosby, revealed for the first time by the older brother who watched him grow into radio's leading crooner. Packed with unknown facts about Bing—his boyhood fights and hopes, how he was nearly lost to radio when he became convinced he didn't have "the stuff."

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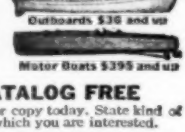

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Bait Casting and Fly Fishing

(Continued from page 87)

how light the line, so much greater must be the force thrown into the cast by the hand and wrist. A D-line is more fitted for the rod stated than any other size. A rod measuring 8½ to 9 feet in length, weighing about 4 ounces, will take approximately an F-line. The rod of 9 to 9½ feet in length, weighing up to 5 ounces, will take the E-line. Some prefer the C-line, the heaviest, for heavy bass rods.

Use Good Leaders

Leaders are necessary in both trout and bass fly fishing. This so-called trout size and the bass size of gut leader at once identify the type used in such fishing. Trout leaders are often put out nine feet in length. It is hardly ever necessary to go better than six feet in length, and hardly ever necessary to use more than two flies to a leader, that is, the tip fly and the central or dropper fly. Be sure to use good, high grade leaders.

Here are your most tempting wet flies in trout fishing: The Coachman, Royal Coachman, Beaverkill, White Miller, Professor, Cowdung, Grizzly King, Queen of the Waters, Black Gnat, Brown Hackle, Montreal, Scarlet Ibis, Silver Doctor, Cahill and Parmachene Belle. There are many others worthy of attention but with the above flies in your possession you can face any trout water of the country and expect to have good luck. The above flies, coming in a large size, tied to a Number 1-0 bass hook, are excellent for fly fishing for bass. The writer prefers, however, using this size of fly on a spinner-shaft, as the combination of spinner and fly movement in the water is most intriguing. Let the spinner be the Number 2, oval size, gold finish preferred. My favorite fly is one possessing hackles, but no upstanding wing feathers. The Yellow Sally fly combined with the spinner is the writer's favorite bass fishing lure when the fly rod is used.

Other bass lures, suitable for fly fishing, involve numerous types of floating bass bugs, many of which are found on the market. There are also many lifelike lures that may be added to this list along with feather minnows.

Bait Casting Equipment

Now we will consider bait casting equipment. Bait rods are to be had in both bamboo material and in metal, both the cheaper seamed tubular steel rods and the seamless modern steel tubular rod. There are also solid steel rods which are especially useful in strenuous fishing, as in trolling for large fish.

The new seamless tubular steel rod combines greater strength with the light weight of bamboo and is suitable for all-around purposes. The bamboo rod is chiefly used in bait casting, and, while heavier trolling rods of bamboo are also made, the ordinary bamboo casting rod is never used for such purposes.

Bamboo bait casting rods range 4½ to 6

(Continued on page 133)

Bait Casting and Fly Fishing

(Continued from page 130)

feet in length. Five feet is considered standard length. The 6 foot rod is best used for casting light lures, such as the Number 3 spinner and pork strip, or the pork rind lure itself. Such a rod does not re-act well in casting ordinary plugs.

Bait casting rods in bamboo come in two pieces, butt piece and tip. The one-piece bamboo rod permits better casting, but the rod is somewhat difficult to carry. The solid steel rods and the new high-grade seamless tubular rods come in one piece construction.

Be sure that the rod has a good reel locking device. The finger-pull under the reel seat, over which the fore-finger is hooked when casting, assures one a firmer grip on the rod and therefore aids casting. The guides should all be lined with agate. The handgrasp should be of solid cork. Try out all manner of handles until you find the one that fits you like a glove. This is best ascertained by putting the reel on each rod and going through the motions of casting with it.

Reels and Lines

The standard bait casting reel carries 100 yards of twelve-pound test bait casting line. The reel should have the level winder device that spools the line back and forth. The reel should have what is known as a balance-handle, that is to say there are two ivory or bone handles instead of just one.

For the casting of light lures, in the one-half ounce class, the line should be in the soft-braided class, ranging 12-pound to 15-pound test. The 18-pound test hard braided line is the one mostly used in bait casting. It will handle all manner of plugs and lures of the standard size. Hard braided lines that range 24, 28, 30 and more pounds are mostly used in trolling, and in the taking of large fish.

In the light bait casting line, there is much wear and tear at the end of the line for a distance of six or more feet. Test the line every morning and clip off the line that you can jerk off easily with your two hands.

Improving Your Casting

The line when spooled on the reel should reach to within a quarter inch of the reel barrels or cross-bars that support the end plates. To accomplish this, make a core out of old line, sufficient to carry the line up to the given point. By carrying the line high in this manner, your casting is improved fifty per cent, and you have better control over the spool with your thumb.

The belief that it is necessary to have a tool-chest full of lures with you to be successful in bait casting is all wrong. You may select five or six lures and be able to face any bass waters.

Chief among the wooden plug lures is the familiar wobbler with a weaving, snaky movement through the water. The best color combination is red head and white body;

(Continued on page 134)

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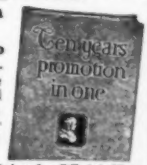

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Build a Wind-Electric Generator

(Continued from page 118)

the two by four to further snug things home.

Tower height is not so important as is the mounting of it in a breezy place. Do not mount it near buildings. A tower height of ten to fifteen feet will be found serviceable in the prairie states. Seaboard locations will be better near a hilltop.

The wiring diagram is shown. The frame of the generator is negative, and the wire from this goes to the proper ring on the commutator to the negative charging clip which is fastened to the negative pole of the battery. The other is led through the ammeter and to the positive pole. The ammeter and the switch is, of course, located in a shelter, preferably the building where the batteries are charged.

Bear in mind that the ideal treatment for a battery is to keep the water level constant, and to use about the same amount of current as is put into it. You can keep mental books on this, and come out about right. The great thing to avoid is to overload the battery. If you are using lights, this condition will make itself known at once through the dimness of the lights.

If the cutout that comes with the generator is left on, the generator will not begin charging until a certain output is reached. And if the current in the batteries becomes stronger than the current delivered by the generator, the cutout switch will turn off the juice. So you have no fear of the battery running itself out by reversing the current output and running the generator.

A word of advice: while this wind generator can be built for a few dollars, it is wise to use a good generator. Second hand generators sell for around $3 to $5, and should have good bearings, a tested charging rate, and a dry commutator well cleaned before you use it. As for ammeters—use the one on the car the generator was taken from.

Bait Casting and Fly Fishing

(Continued from page 133)

second best, all-yellow or yellow body and red head.

Some plug lures are both top-water and underwater. They come to the surface when not reeled and operate underwater when reeled. The imitation of a young pikie minnow is probably the most taking in this class.

A top-water or surface bait, with a notched head or one provided with a metal collar or head-piece, which may be jerked on the surface in pop-fishing, is an important addition to your list of lures. This jerking of the bait on the surface to stir up the water intrigues the bass and causes many a fine specimen to strike. The so-called crippled or wounded minnow type, which lies on its side, having a blade spinner fore and aft, is an excellent lure.

Among spoonhooks the regulation spoonhook, Number 5 size, is most effective. This will not only take bass, but great northern pike and other fish as well.

Inside Uncle Sam's New Gold Vault

(Continued from page 39)

contains a reflecting light, situated so that at any given moment an inspector can see the entire length and breadth of the sub-basement. Thus, in case an unauthorized person has somehow sneaked into the basement and is noted by the inspector, the latter simply picks up one of these lamps, ingeniously shaded so that he can see the interloper without in turn being seen, and determines his exact location. The guard then starts the automatic alarm system by simply touching one of the doors opening into any one of the sub-vaults which promptly brings secret service men to the scene.

Storing Untold Wealth

The amount of money that can be stored in this treasure fort reaches a staggering figure. The old vault had space for 472,000,000 separate pieces of paper currency, ranging in value from one to ten thousand dollars. In hard coin the former structure had space for about $11,000,000 in gold, 47,624,000 standard silver dollars and about $28,000 in small change. More than double these amounts can be accommodated in the new vault.

Besides serving as the largest money chest in the world, the new vault will also be used as an "aging cellar" for new paper money. In order that ink may dry completely, new currency must undergo an aging process which lasts about six months. The former vault had insufficient space for lengthy storage; hence, bills were issued "green" and consequently wore out rapidly.

According to James D. Owens, Treasury construction engineer, only thirty days were required to wreck the old vault, whereas it would require almost a year to destroy the new one.

Mr. Owens goes on to explain that the specially hardened iron on the outside of the upper and lower vaults is so tough that after it is cast no holes can be bored into it, nor can it be shaped or cut. All the holes, special fillings and shapes were cast when the iron slab was cast, ready to fit into place.

The walls are filled with concrete, reinforced with material which resembles giant "chicken wire." A burglar tunneling in from below would have to penetrate six and one half feet of concrete and steel in the floor.

Last Word in Fireproofing

More fireproof than any other modern structure conceived by man is the way engineers describe the treasure chest. They point out that aside from the stored money and securities there just isn't anything connected with the vault that will burn. Nor can the vault be successfully bombed. The resiliency of the steel webbing described above will prevent the slightest structural damage.

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28x5.25-18		2.90	1.15
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31x5.25-21		3.25	1.15
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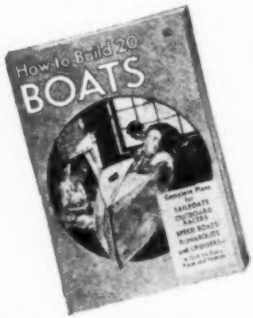

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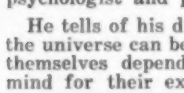

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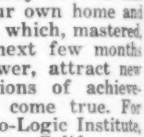

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Science Builds 200-inch Telescope

(Continued from page 61)

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Reflecting Surface to Be Aluminum

The glass disk, after it is shaped and polished, will not be coated with silver as has been done in the past. The reflecting surface of the 200-inch mirror will be aluminum, put on the disk by a special process developed by Dr. J. Strong, of the California Institute of Technology. The mirror will be placed in a high vacuum. Tungsten wire, coated with aluminum, will be heated electrically until the aluminum evaporates and collects in the form of a vapor on the mirror.

The pouring of the glass disk was a great spectacle. Approximately 7,500 persons, in addition to more than 100 scientists, witnessed the operation. In a large furnace in the Corning Glass Works the 34 tons of pyrex borosilicate glass was heated white hot at 1,500 degrees Centigrade.

The mold, studded with circular cores which will leave indentations in the mirror for mounting purposes, rested on the floor of the brick igloo. A workman, with a shield before his face, opened a furnace door. Eight men shoved the 20-foot handle of a huge ladle into the glaring interior, dipped the bucket into the dazzling mass of liquid and came out with 750 pounds of molten glass.

The ladle was trundled along an overhead monorail to the brick igloo where 400 pounds of the glass were poured into the mold. The other 350 pounds hardened before it reached the mold, and the glass had to be broken off.

Workmen Labor Ten Hours

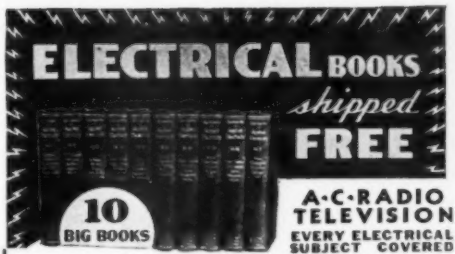
Three ladles were used, one for each furnace door. For ten hours the ladlemen dipped and poured load after load, while spectators looked on in relays.

The ladles became red hot on each trip and had to be dipped into water to cool before taking on another load. The molten glass was so hot it melted some of the cores from the mold. These were found floating on the liquid glass, and had to be taken out with ten-foot pincers.

The glass is cooled very slowly so that it will anneal properly and will not crack. Within a short time the glass experts will be able to judge the success of the pouring. If the glass is found imperfect the great task will have to be done over.

In 1938 this telescope, the greatest ever devised, is expected to be ready to turn on the heavens and seek new fields. The great mirror will be held in a 60-foot skeleton steel tube in an observatory yet to be built.

When all difficulties are overcome, man's greatest "artificial eye" will look three times farther into space than is possible now.



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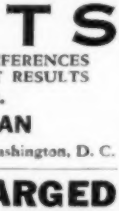

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Seek Wealth in Needed Inventions

(Continued from page 81)

Those who have tried to bevel edges uniformly with a plane would appreciate a little attachment for such tools that would prevent a workman from taking too large a cut and that would not only bevel the edge at the proper angle but also remove only a predetermined amount of wood.

There is needed an attachment for a three-jawed lathe chuck to make the chuck accommodate square rod. The attachment should be cheap; say two or three dollars. The object of the invention would be to make the cost of a four-jawed chuck unnecessary for the small workshop.

The man who can invent a method or a device that will prevent sole rubbers from slipping off the feet will find himself in possession of a fortune in no time. Hundreds of thousands of people would wear rubbers of this type if they could be sure that they would stay in place.

The erasers on the end of lead pencils do not last as long as the pencil itself on the average. One large fortune was made in placing the rubber on the end of the pencil and now another fortune awaits the man who can equip the lead pencil with a longer rubber with a method of feeding it as it wears away.

There is a need for a fountain pen that will register the amount of ink it contains without the pen being transparent.

Northland—Rescue Ship of Arctic

(Continued from page 128)

his journey in a Russian plane, sent the *Northland* hurrying to Chukotski, in Russian territory, and to Indian Point, in the same vicinity. They learned that residents thought they had heard the roar of an airplane motor, but that was all. A week later the cutter anchored at Nome in a heavy fog. Mattern and his two Soviet companions were searching at the moment for Nome, but were lost in the fog. They were almost completely out of gas. Suddenly the fog lifted. They were three miles out. There lay Nome almost at their feet, with the *Northland* riding the gentle swells in the bay. The aviators dropped to the water and took to a collapsible rubber boat. The *Northland* sent a fast motor boat to their rescue and carried them to safety at Nome.

The *Northland* is equipped with every facility to aid the needy, from her "floating hospital" to her complete mechanical outfit. She is 216 feet long and is of 2100 tons gross tonnage. Her cruising radius, 17,000 miles, is said to be as wide as that of any vessel afloat. Her hull is protected by a 1¼-inch steel plate extending three feet above and six feet below the water line. Three inches of cork line the quarters of both officers and men to guard them from the bitter cold.

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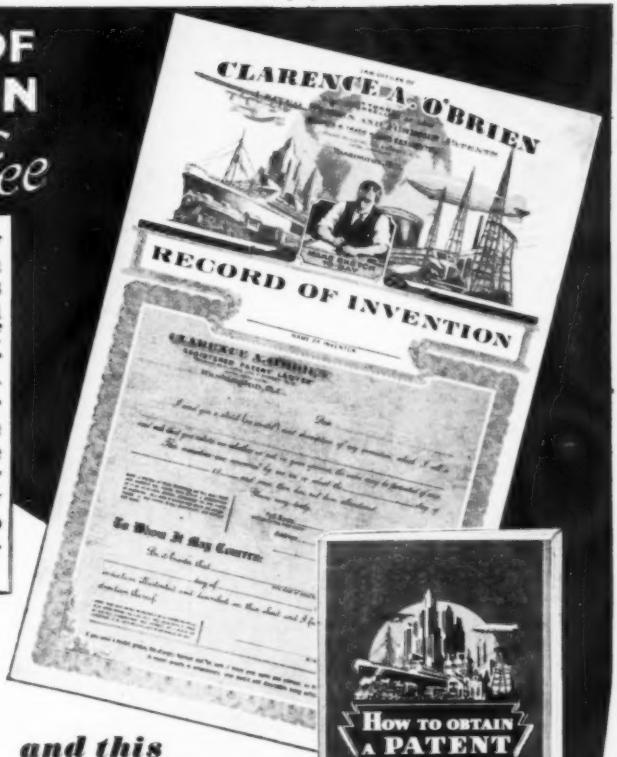

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New Inventions Answer Varied Public Needs

This new desk-style cigaret case eliminates fumbling for smokes. When case is opened, the cigarets stand on end, criss-cross fashion. Note auxiliary rack in cover.

New burners for gas stoves have openings in side of mountings. Boil-overs run past fuel openings and will not clog flame.

A bridge table beverage shelf keeps glasses and smoking trays from cluttering up the table. The metal shelf holds two glasses and a cigaret tray and is attached to the table leg.

A boon to husbands are these "coal sticks" which simplify furnace tending. The sticks are made of low grade coal, pulverized, compressed into cylinders and wrapped in paper. They are fed by hand into the revolving magazine of a new furnace which requires only one filling every 24 hours.

New salt and pepper shakers resembling large cherries are colorful additions to the dinner table. The cherry proper holds the condiments. The shakers are filled by unscrewing the stem.

Turning small ice cream freezers is a simple task with a new attachment which snaps onto any freezer. Capacity load, three quarts.

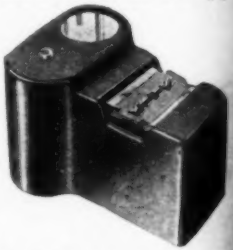
Invisible photos are possible with a new liquid offered to experimenters. Image disappears when liquid is applied, returning when operator passes dampened finger over picture.

A portable brake-testing machine weighing only 32 pounds fits over tire of each wheel separately. The machine registers condition of brakes on a permanent record card.

Insulated flashlight cases for work around switchboards are now available. Circuits of 16,000 volts cannot penetrate the fiber case.

A new type power mower makes grass cutting an easy task. A small four-cycle motor drives both the tractor and the cutting knife. Machine is equipped with both sickle bar and the common reel type mower and performs anywhere a man can walk.

Wash-rack chamois cloths can be dried simply and quickly with a new wringer which has a balloon roller to prevent tearing or crushing chamois.



Flashlight batteries run this handy razor blade sharpener.

A new type of adhesive plaster has a waterproof backcloth permitting use out-of-doors. Sanitary and virtually dirtproof, it is ideal for surgical use where frequent washing is necessary.

An auto key duplicating machine requires no attendant. The customer merely inserts his key and a key blank; machine does the rest.

A steel wire dog brush combs out the thickest fur, yet is flexible enough to massage and gently stimulate the skin beneath.

A variable-voltage adjuster eliminates below-normal performance of electrical appliances by correcting voltage of supply line.

Editor's Note—Information on any of these items can be obtained by writing MODERN MECHANIX AND INVENTIONS. *Manufacturers are invited to submit material for this page.*